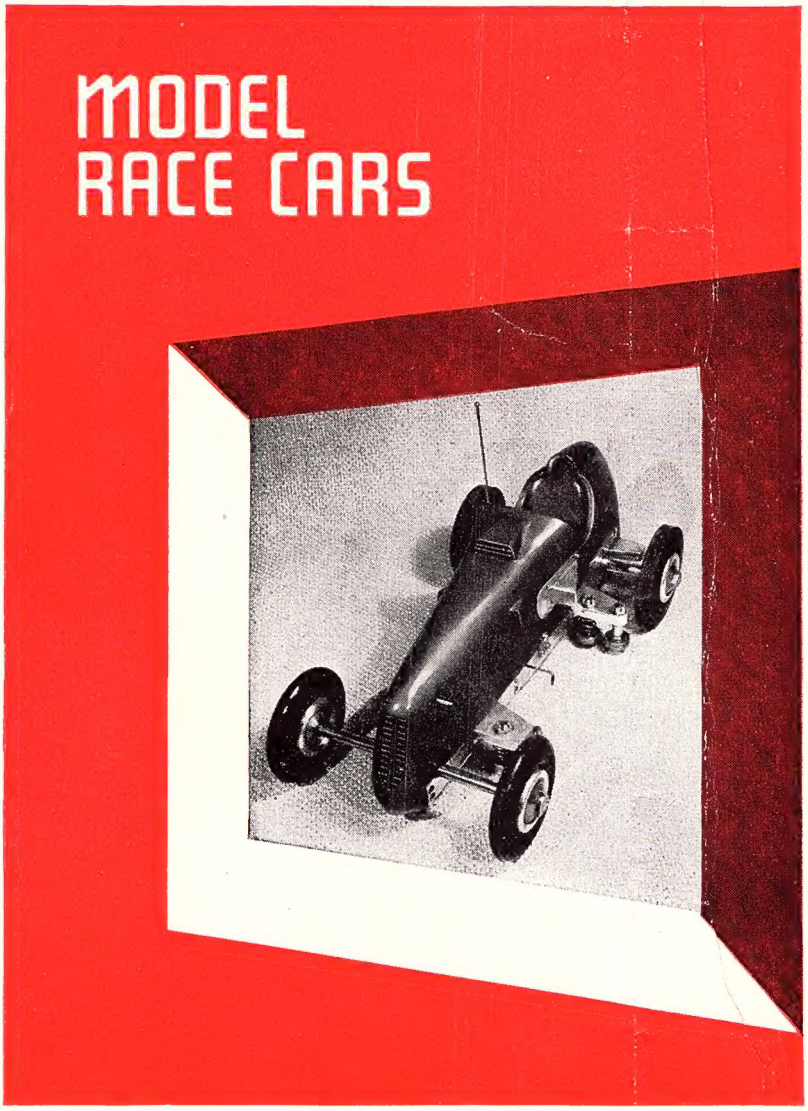
THE MODEL CRAFTSMAN

100% MODEL RAILROADING

MAY, 1948
35 CENTS

PIONEER MODEL RAILROAD MAGAZINE



Slightly delayed due to the prevailing printers strike!

Yes . . . This is the Cover of Model Race Cars . . . A preview of the first issue. Model Race Cars will appear in the same format as the present MODEL CRAFTSMAN and will be chock-full of articles on construction, maintenance, operation, accessories and tracks. Any MODEL CRAFTSMAN subscriber whose interest is only Race Cars may have his subscription transferred to Model Race Cars. The newsstand price will be 25c or $2.50 per year.

PENN PUBLICATIONS

MODEL RACE CARS RAMSEY, N. J.

THE MODEL CRAFTSMAN

Vol. 16, No. 12 May, 1948

CONTENTS FOR MAY 1948

GENERAL ELECTRIC 0-4-4-0 — By Lewis Austin 6
Mounting the power unit is described this month.

THE LITTLE B & O — By Larry Sagle 8
The rebuilding program on the world's largest portable O gauge layout

KIT OF THE MONTH — By Roy Millard 11
A beginner describes his reaction to the various kits on the market.

YOUR NABOR'S PIKE 12
Contributions of photographed models received from readers.

VERTICAL TWIN-CYLINDER STEAM ENGINE — By Albert V. Lindsay 14
An efficient, half-horsepower steam engine — no power tools required for construction.

THE WATCHMAKER'S LATHES — By William Schopp 17
The correct use of this lathe and its use to hobbyists.

GETTING STARTED — By John Barkley 20
A discussion of the various tools necessary for model railroading.

THE LAYOUT DOCTOR 22
This month the doctor goes to work on two HO layouts.

DIESEL PASSENGER LOCOMOTIVE — By Warren B. Crater 25
The First of a series on a Mixed Train Special.

ONCE UPON A RAIL — By James D. Hall 30
Building a Deluxe White and Gold Passenger Trolley, another "old-timer."

ALONG THE TINPLATE TRACK — By Louis H. Hertz 34
New notes on "Howard" models are bought to light.

WHY NOT 36
A page of constructive kinks on model building by the readers.

THE SAFETY VALVE 4

RAILROAD CLUB NEWS 5

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This month's cover is by Allan Campbell of Pawtucket, R. I. The model is a Pacific type locomotive in HO built up from a Varney Economy kit. Mr. Campbell's first major project.

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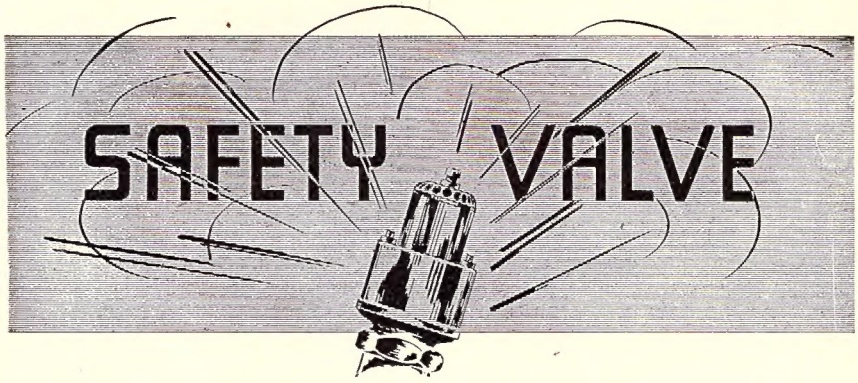


FOOD FOR THOUGHT

At long last Model Craftsman has made the long anticipated change. The April issue lived up to all the advance notices. Your decision has made me a life time subscriber. I'm an O gauge fan of long standing and have a rather complete layout.

At present I'm interested in making a live steam engine in O gauge to run on my regular layout. If it's possible and has enough interest for the other fans, will you please publish plans for an O gauge live steam loco. A couple of other fans in this locality are also interested in a live steam O gauge engine.

I would like to have a remote control model if possible. The type of fuel for heat is unimportant, but looking at it from a layman's standpoint, I should imagine an electrical unit in the fire box would do the trick. The electricity could come from the already electrified rails . . . Arthur Walters, Washington, D. C.

MEMBERS WANTED

My suggestion to Alfred Washburn — after reading his article The Model Vacation — is that he should join the N.M. R.A., then he would get the Year Book — with all the local fans listed, their addresses, gauge, etc. and also a list of Model Railroad Clubs, not to forget the nearest Hobby Dealer — all in a small book — oh yes, it costs $2.00 per year to join. . . . Bailey, Bronx, New York.

CORRECTION!

PULLEEZ, in next issue run a note something like this:

"In Bill Schopp's article on a Wayside Station in the April Model Craftsman, due to an artist's error in the drawing on page 34, the trolley wire is incorrectly shown. The wire frog should be *directly* over the switch frog. This is indicated in the text only by a referral to the drawing."
ing."

Also, the Layout Doctor drawing was screwed up too, Just a few words on the April issue which may help you. I think on the whole, and especially considering the difficulties of getting it out, you did a very good job. But — going over it bit by bit — . . . Cover: best in a long time.

Safety Valve: second and third letters sound half-baked!

Lewis Austin and Fuel dealers yard — good.

Getting Started — as he says, here we are again — it's very good stuff, but it could have been improved by some kind of photo or drawing showing comparative sizes.

Wayside Sta. — space wasted on plan. Also drawing on third page is screwed up as I pointed out on postal yesterday — Whose mug is that anyway?

Model Vacation — article stinks. Sounds like it was written by a staff member to fill up space, and in a hurry. It is the kind of stuff Frank Wilson or Secor would write. However, the cartoons are quite entertaining even though the girls bathing suit stray is missing!

. . . Bill Schopp, Trenton, New Jersey. P.S. Looks like I am lost again, started to build a model station yesterday!

IT WAS THE STRIKE

What in the world happened on page 50 of your April issue, I mean in the lower left hand corner. I'm a newsstand buyer and after checking through twelve copies, I still couldn't find one good one. I wouldn't have cared if it was a race car or airplane article, but when its some darn good meaty information, its real discouraging. I finally deciphered it and hope you'll be able to keep up this kind of stuff, its darn good — I mean the material, not the printing. All in all, the April magazine looked very good, you had a good selection of articles, but how come it was so late? . . . Paul Nichols, Bridgeport, Conn.

MEMOIRS A MEMORY

I was most disappointed and let down when I read the final installment of Memoirs of a former Model Railroader in your March issue. I have been reading your magazine for years and believe this to be the best series of articles you have printed to date. It's too bad you couldn't have gotten Bill Schopp to write it up in more detail so it could have appeared in more issues. I'll be willing to bet that by next year he could write a sequel to this series. — He'll start up again in the hobby by the end of summer or my name isn't . . . Jim McConnell, Binghamton, N. Y.

Railroad Club News

BROOKLYN, N. Y.—The Bay Ridge Model R. R. Club has now completed the entire structure for their O gauge layout. Next on the program is the laying of road bed, ties, rails and wiring. The layout will also include an interlocking section, complete with relays, interlocking machine and a complete control panel from which the entire system can be operated. A signal system is being used that will actually work.

The club has a few memberships open, for information, contact Tom Brecht, 654 73rd Street, Brooklyn or stop at the club any Thursday evening or on Saturday afternoon. The address is 28 Marine Ave., Brooklyn, located in the basement of what once was a gymnasium. The boys will be glad to see visitors, discuss membership and answer any questions on railroading.

COLUMBUS, OHIO—On August first, the Central Ohio Railfans Assn. will stage a fan trip over the remaining rail lines of the Columbus and Southern Ohio Electric Company. Abandonment of these lines has been scheduled for the first week in September. Two and possibly more cars will be chartered for the occasion. The Trip will start at 1:30 P.M. from Chestnut and High Streets, fare will be $1.50 per person. Reservations may be obtained from the Assn., 73 East Gay St., Columbus 15, Ohio.

Portsmouth Club Exhibit

THE Portsmouth R. I. Model R. R. Club, operators of the Mt. Hope Bay Lines, were awarded a second place ribbon in the professional class at an exhibit held April 3 and 4. Their exhibit as shown below was one of the feature attractions at the hobby show held in New Port, R. I.

The Streamlined locomotive in the photo is a converted American Flyer Atlantic type and was blocked up on the track with the drivers and smoke unit operating. Smoke can be seen coming from the stack in the picture below.

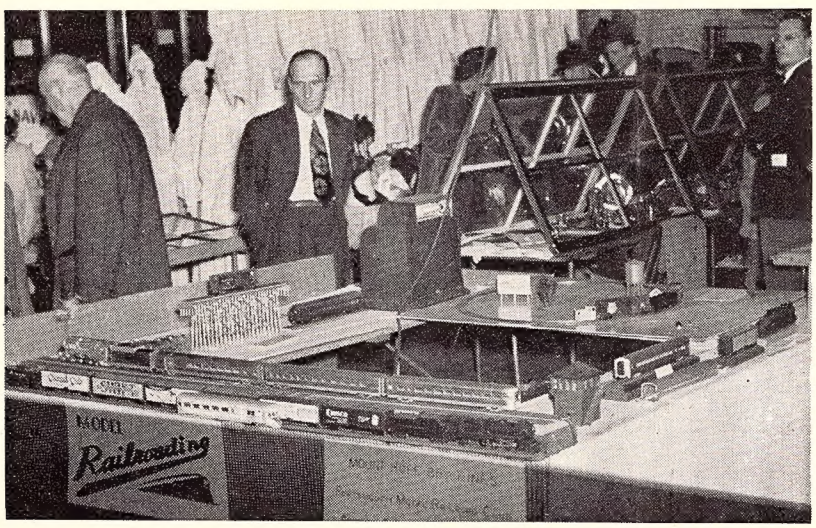
The second streamlined car or combine is equipped with a Senco sound system unit, and this in conjunction with the operating locomotive and smoke system combined to produce a real crowd drawing attraction. The loop of track in the background is just 30 inches in diameter and the model of the GE 25 ton switcher as well as the Pennsy O-6-O switcher (to the right of the loop) provided almost continuous operation.

The streamlined passenger coach in the right foreground is completely detailed on the interior with upholstered seats, lavatories and even fluorescent lighting obtained through the use of lucite strips on the ceiling. The rail liner in the foreground is a free lance job built by E. C. Fletcher and was modeled after those used on the Susquehanna R. R. A partially completed Consolidation locomotive may be seen just behind the streamlined Atlantic. Two super detailed 50 ft. refrigerator cars were on display in the illuminated cabinet at the extreme rear of the layout. The club is an enthusiastic "S" gauge outfit, all equipment shown is in $\frac{3}{16}$" scale.

CANTON, OHIO. The Mid-Central Regional Meeting of the NMRA will be held in Brewster, Ohio on June 20th. Headquarters will be the Wandle House with a trip through the Wheeling and Lake Erie Shops. Full details can be obtained from the Acting Chairman, Bob Bast, 1237 Logan Ave. NW, Canton.

SCOTIA, N. Y. The Scotia HO Model R. R. Club will have an exhibit at a hobby show to be held in Schenectady on May 20, 21 and 22. In addition to models made by members of the club, the exhibit will feature an O gauge, 2-rail, 12 volt D.C., 16 foot loop with a passing siding on one side. The loop will be divided into 12 blocks between the passing siding representing 6 blocks after leaving an interlocking where the signals are approach lighted and go out if there is no train

(*Continued on page 37*)



The Portsmouth R. I. Model R. R. Club exhibit held on April 3 & 4

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PART II **By LEWIS AUSTIN**

IF you have completed everything described in Part I of this series, you are ready to mount the power unit on your motor truck. As the drawings show, the power unit on this model has a chain of three spur gears from the motor to the shaft on which the worms are mounted. The small gear on the motor shaft slows the model down so that it just barely crawls along. If you intend to use the model as a switcher as I do, the slow speed will be true to prototype. It will also enable the model to shunt cars over the yard switches without derailments. However, if you want to use the model for hauling freight on your main line, it would be better to use only two spur gears both with the same number of teeth. One would be mounted on the motor shaft and the other would be mounted on the worm shaft. This will leave the ratio at 26:1 which is the ratio of the worm and worm gear. On full power, the model should then run at a scale speed of about 65 miles per hour. In order to mesh the gears that you use, the motor could be lowered almost one ha'f inch, but do not use gears that will make it necessary to mount the motor any higher than the drawings show. At the height shown on the drawing, the motor just about clears the roof of the locomotive body.

Start construction by making the base of the power unit. The sides are filed out of ¼" by ½" brass as shown on the drawing of the assembled power unit. The slots for the axles are made by drilling and reaming ¼" holes in the sides and then sawing into the holes to make the slots. The holes have to be drilled the same distance apart as the holes in the truck sides. Finish up the slots with a file so that the pieces fit nicely over the axles. Do not forget to file a radius in each side as shown on the top view. This radius is necessary to clear the body bolster.

The spacers are made next out of brass. These are clamped in place between the sides making certain that the sides are l ned up square and parallel. Then drill #50 holes through the sides and into the spacers where the screws are shown on the drawing. Take off the clamps and mark the pieces so that you will get them back in their correct positions. The holes in the sides are then opened up to $\frac{3}{32}$" and counterbored about $\frac{1}{32}$" deep with a $\frac{3}{16}$" drill. The holes in the spacers are tapped 2-56.

Assemble the parts again using 2-56 screws and make sure that everything is lined up properly. When this is done, flow solder in all the joints to make certain that the parts will not shift out of place later on. Also, flow solder around the heads of the screws and then file off the heads so that there is nothing projecting out from the sides of the unit.

Four strips of $\frac{1}{16}$" by ¼" brass are cut out to hold the base of the power unit on the axles. Clamp each strip in place and drill #50 holes through the strips and into the base of the unit. Open up the holes in the strips to $\frac{3}{32}$" and tap the holes in the base for 2-56 screws.

The end plates are filed to shape out of ⅛" thick brass. Drill and tap the 2-56 holes for mounting the plates on the ends of the base. Counterbore the $\frac{3}{32}$" clearance holes in the end plates so that the heads of the mounting screws will not project out too far. Lay out the $\frac{3}{16}$" holes in the end plates for the worm shaft while the plates are mounted on the base. The dimension from the centerline of the axle to the centerline of the worm shaft is $\frac{7}{16}$" if you are using the Pittman gear set that I used. After the holes are laid out, remove the end plates from the base and drill and ream the $\frac{3}{16}$" holes. The holes in the Pittman worms will have to be opened up so that they can be pressed on the $\frac{3}{16}$" drill rod shaft.

If you are using only two spur gears from the motor shaft to the worm shaft, it will not be necessary to make the one end plate as high as the drawing shows. One gear will be mounted on the motor shaft which does not have to run through a hole in the end plate and the other gear will be mounted on the worm shaft.

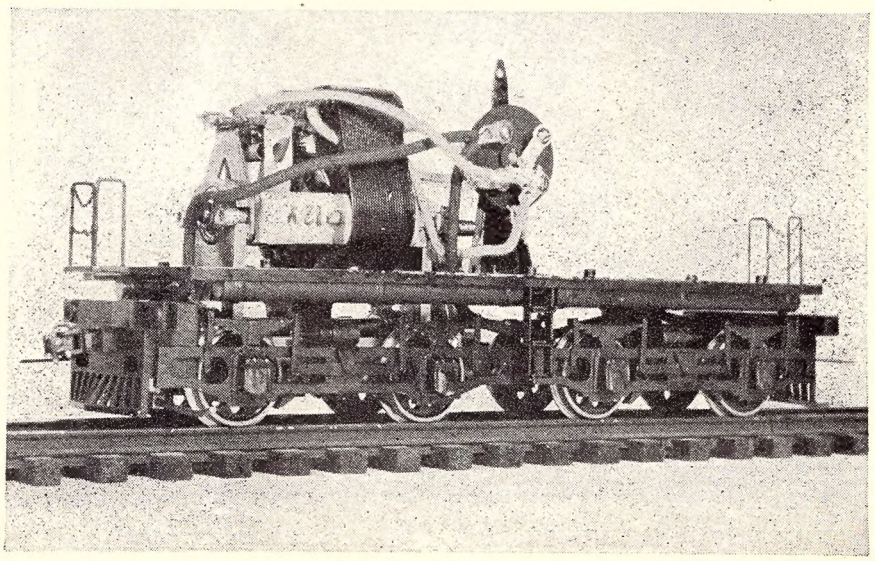
The motor brackets are made out of $\frac{1}{16}$" thick brass. Cut them to the width shown on the drawing and square up one end. Bend the base of each bracket as shown and drill and tap the holes for mounting the brackets to the base of the power unit. When this is done, mount the brackets in place and lay out the centerline of the motor shaft on the brackets. This dimension will depend on the size of the gears that you use for your model. You will have to check and find out what the gear centers should be and lay out the hole center accordingly.

After the centerline of the motor shaft is laid out, remove the motor brackets and drill and file the opening for the motor bearing housing. Then file the slots for the screws as shown on the drawing. This completes the power unit and it can now be assembled and mounted on the power truck. Spin the motor shaft to make sure that the gearing runs smoothly. Then you can hook the unit up to a transformer and let it run itself in on your bench.

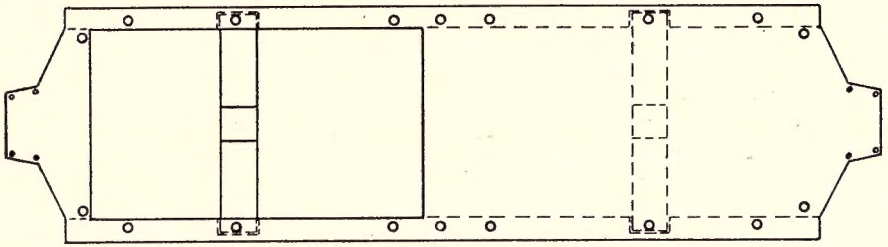
The floor of the locomotive is cut to shape out of a sheet of $\frac{1}{16}$" brass. The shape is shown on the one-half size drawing of the top of the loco floor. Lay out the floor with dividers by doubling all the dimensions on the drawing. Saw and file the floor to shape and drill and saw the large opening for the motor truck. Strips of $\frac{1}{16}$" by ½" brass are then cut out as shown on the dotted lines on the drawing. These strips are notched where the body bolsters will be attached to the floor. When these strips are completed, solder them in place underneath the floor. Lay out and drill all the $\frac{3}{32}$" holes shown on the drawing of the floor and also drill the #60 holes in the ends for the railings. This completes the floor.

The body bolsters are bent to shape out of ½" wide strips of $\frac{1}{16}$" thick brass. Bend them to the shape shown on section X-X. Drill and tap 2-56 holes in the ends of the bolsters so that they can be mounted

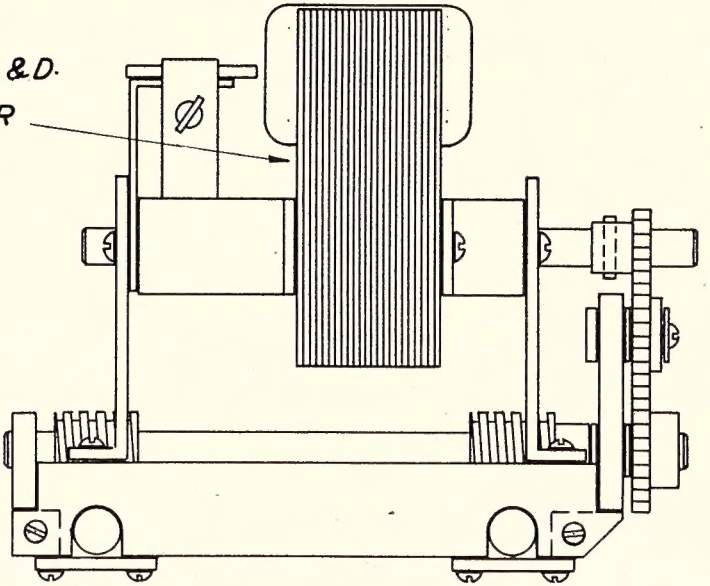
(*Continued on page* 50)

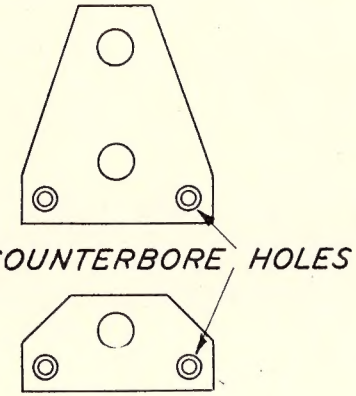


GENERAL-ELECTRIC 0-4-4-0 LOCOMOTIVE

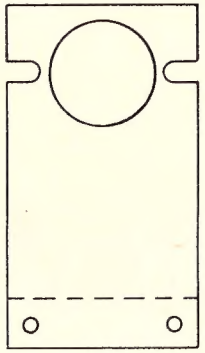


TOP VIEW OF LOCO FLOOR
ONE-HALF SIZE



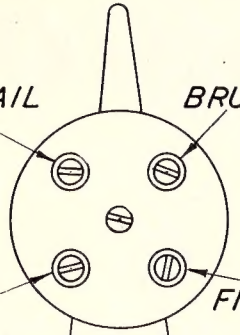


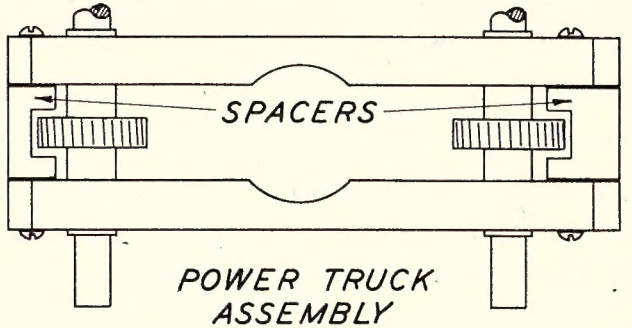
END BEARING
PLATES



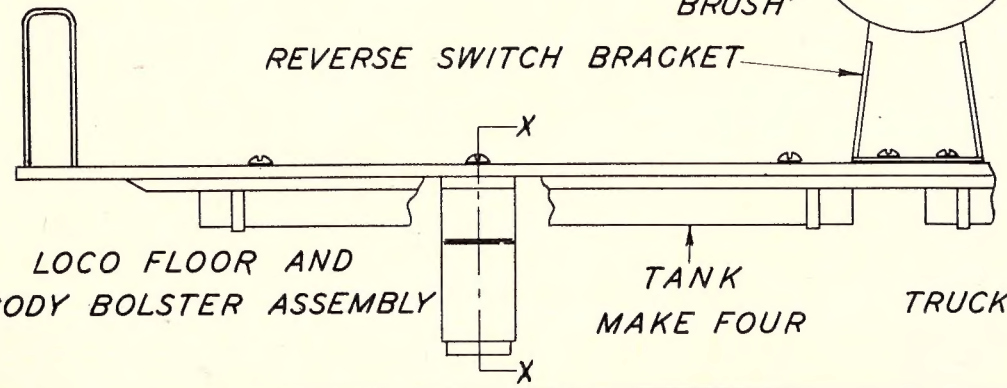
MOTOR
BRACKET

DRAWINGS ARE FULL
SIZE FOR O GAUGE
EXCEPT WHERE OTHER-
WISE NOTED



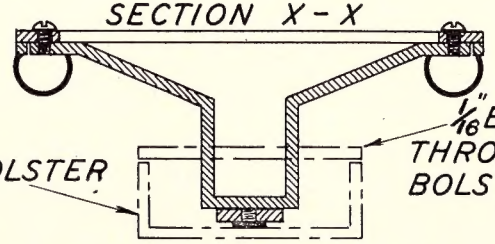


POWER TRUCK
ASSEMBLY

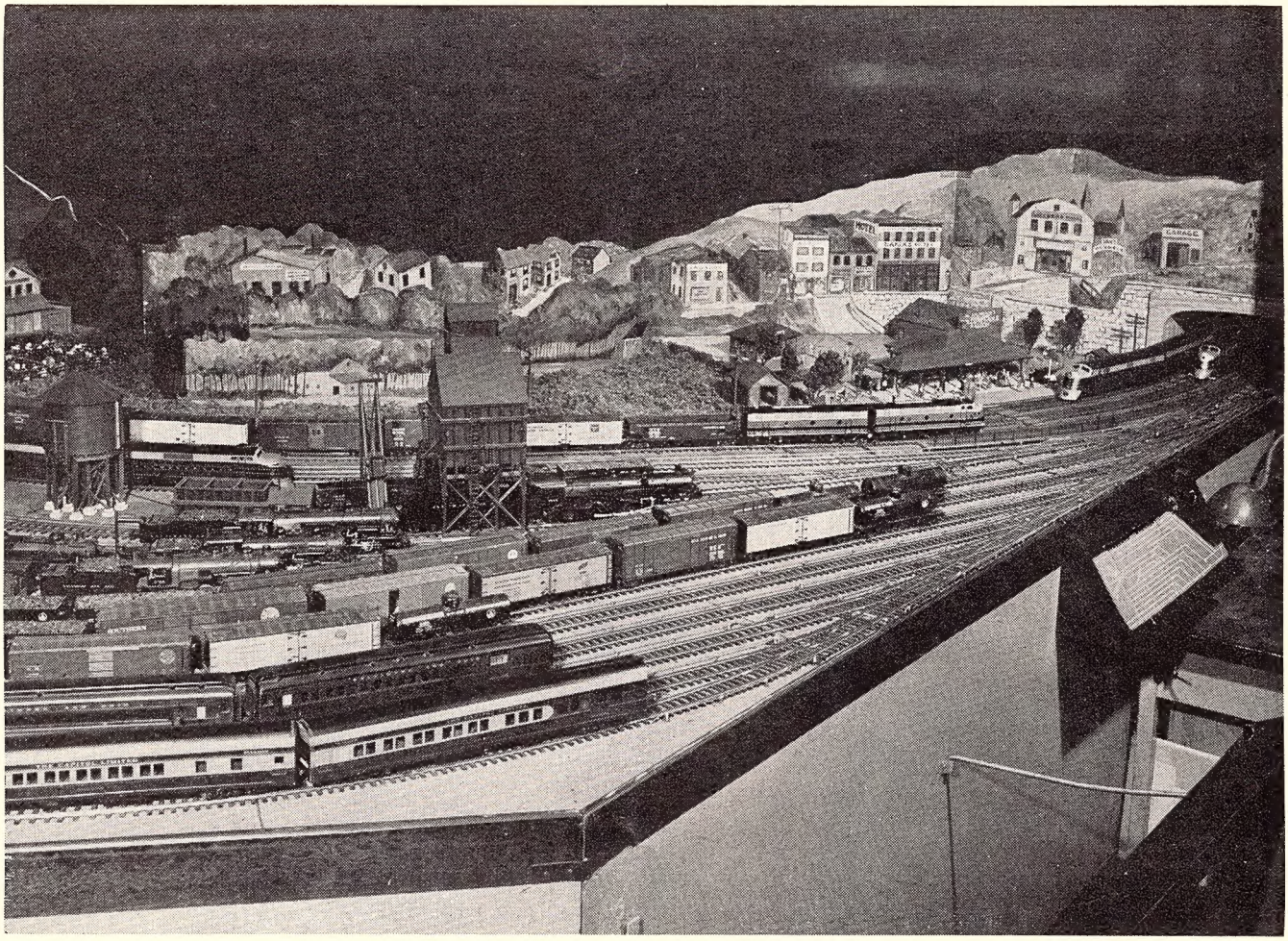


LOCO FLOOR AND
BODY BOLSTER ASSEMBLY

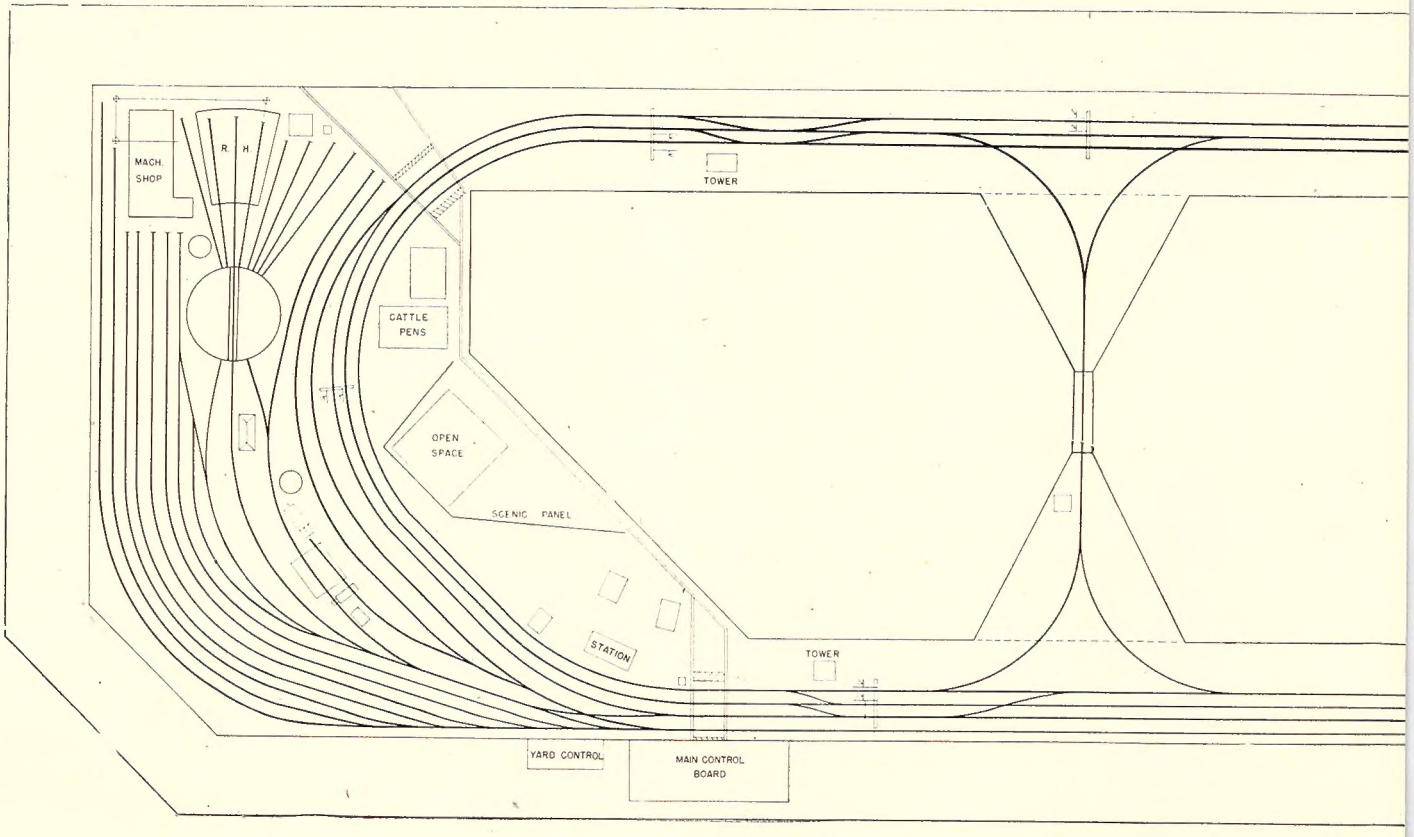
TANK
MAKE FOUR



L. AUSTIN



An inspiration to all model railroad enthusiasts — Tops in "O" Gauge — The portable B & O.



B & O LAYOUT

By LARRY SAGLE

BILL SAKERS was griping, as usual. You have met Bill. He's the boy who usually operates the B & O miniature layout. There were the three of us — Bill, Ken Henry and myself. And we were discussing the operation problems of the finest portable model railroad in the world.

"I need a longer yard lead," said Bill. "Whenever I make up a train, I have to stop operation on the outside track."

"O.K.," I said. "What do you suggest?"

"Well," replied Bill, meditatively. "Let us run another track alongside the outside main for about 20 or 30 feet, and —"

"And," I countered, picking up the conversation, "widen the tunnel portal, put in a new signal at the yard limit, and —"

Here I stopped and stared at the ceiling.

"Oh, oh!" chirped Ken. "There he goes, Bill. Remember what happened when you asked for a simple wye track to turn your Diesels?"

"Oh I know?" he growled. "I asked for a simple wye, but when this guy Larry humped over his drawing board, what did he dream up? Two wyes connected by a bridge. What a headache that has been. Every time I have some nice long trains running and settle down to do a little soldering on a locomotive or car, what happens? Some youngster will tap me on the shoulder and say, "Please, mister, run a train over the bridge."

On the left is a very clear shot of the famous Little B & O, the world's largest portable O gauge layout.

"And what do you do in that case?" I asked.

"Run a train over the bridge, of course," he replied. "Dang it!" he added for emphasis. Ken snickered.

"All right, you two birds," I said. "We have a month in which to do this job. Now, let's see. We'll rebuild the whole yard!"

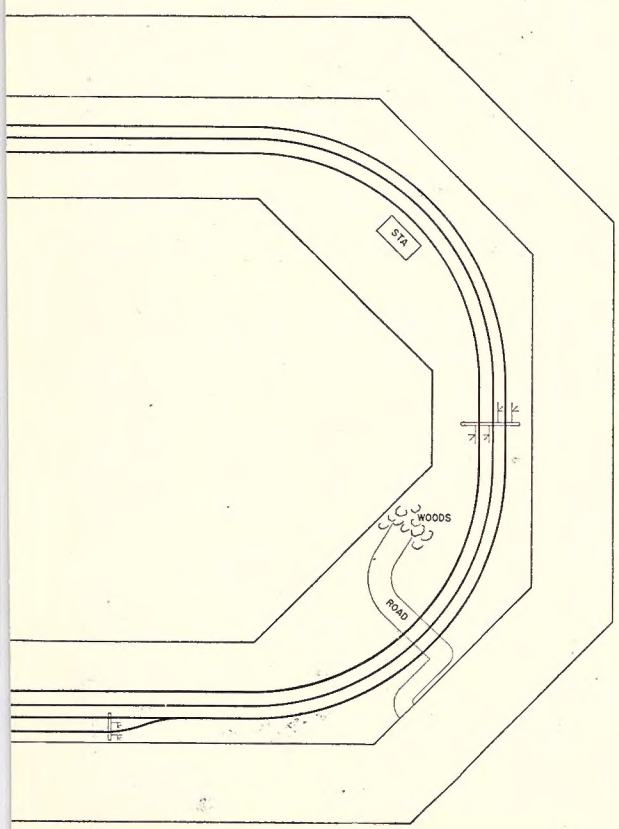
"Oh, mercy!" cried Ken. Bill looked stunned, but soon recovered.

"We just enlarged the yard two years ago," said Ken.

"But I don't like it," I replied. "No ladder truck."

"There's that ladder track again," laughed Ken.

"O.K., smarty," I told him. "You said it couldn't be done before. And I've been figuring it out since, and I think it can be done."



Scale, approximately one-fifth of an inch to the foot. This layout incorporates the various changes recently made.

"If you can figure it out, I can do it," said Ken with a sigh of resignation.

Bill had recovered from his shock and had some suggestions to offer.

"Let's move the roundhouse and turntable and get in some storage tracks," he offered.

"Check!" I said. "And build a ladder track."

"Put a turnout from the mainline at the other end of the yard," said Bill.

"O. K.!" I said. "And put in a machine shop."

"And while you're doing that," said Bill, "make those platform sections smaller so we won't have so much trouble getting through doors and on elevators with the crates."

"Will do," I said. "And we'll have a caboose track, machine shop, storage tracks alongside the roundhouse, a run-around track, a long yard lead, and — a ladder track!"

"And am I to lay all of that track in a month?" asked Ken, weakly.

"That's the general idea," I replied.

"Oh, mercy!" exclaimed Ken in a hoarse whisper, and slumped back in his chair.

"Now, boys," I said, rubbing my hands together — a little habit I have when excited, "let's get busy. Ken, you start looking for rail, switches, fish plates, ties and spikes. Bill, you start building signal heads for that old cantilever signal bridge we have in stock, figure out your circuits, get the wire and relays you will need, switch machines, etc."

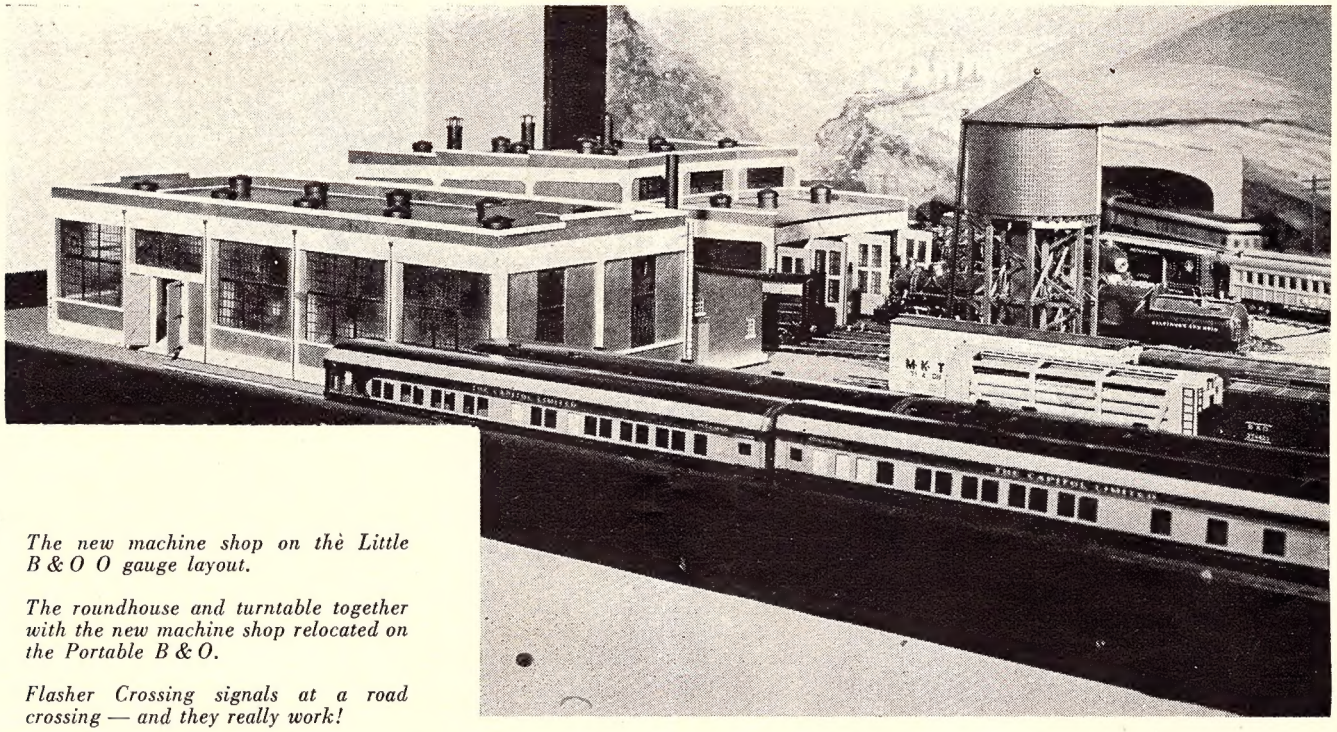
Ken looked at Bill. "See what I mean?" he said. "You would open your big yap and ask for a long yard lead. Now see what happens!"

Bill shrugged his shoulders.

"And," I continued, "don't forget the reversing circuits right into the roundhouse. I'm leaving, right now, for my drawing board."

"Go ahead," they both screamed. "Get out now before you think of something else!"

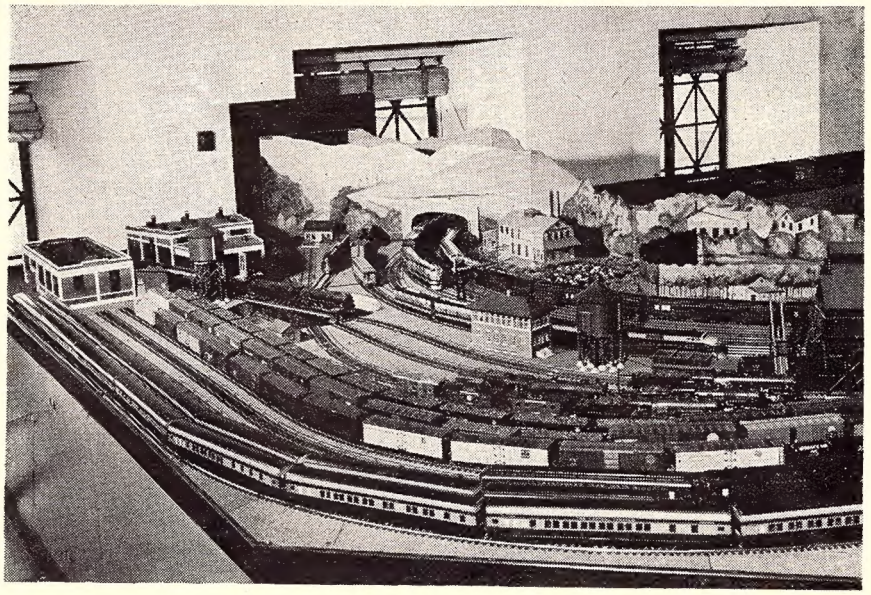
So, folks, that's about how it happened. I did — pardon my little boast — figure out the ladder track, and Ken built it. We made both the basic and hop platform sections smaller, made new packing cases to ship them in, and everything else we planned to do.

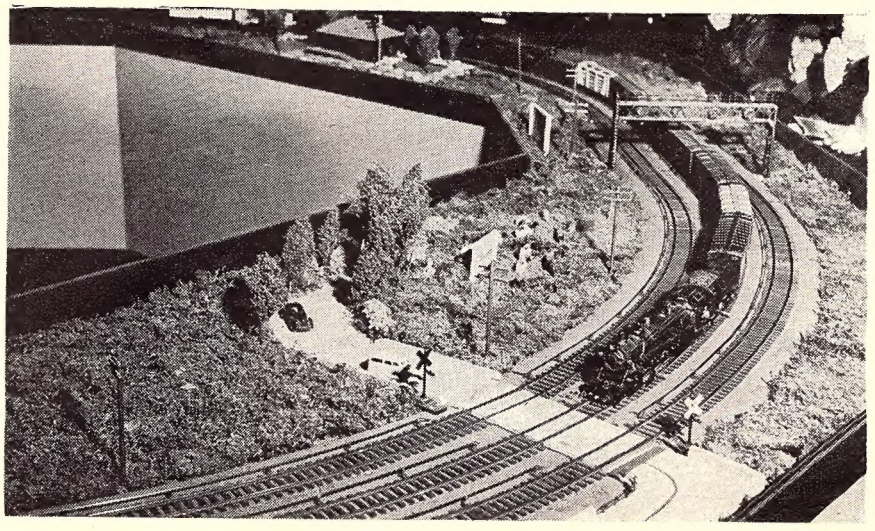


The new machine shop on the Little B & O O gauge layout.

The roundhouse and turntable together with the new machine shop relocated on the Portable B & O.

Flasher Crossing signals at a road crossing — and they really work!





A hurry call to our old friend Ralph Kann (Model Structures), in California, produced a fine machine shop as a companion piece for the roundhouse and now we have *almost* everything you will find on a railroad. Not every last thing, of course, such as material storage, scrap bins, oil house, empty spike kegs along the track, and a lot of small detail — but there is absolutely a limit somewhere to what you can handle on a portable layout. You should have the headache of setting it up in three days (sometimes we have less time than that) and taking it apart and packing it for shipment.

Anyway, as I said, all of this work was completed at our Mt. Clare shops in Baltimore, in ample time for the hobby show in Madison Square Garden, New York, on November 23. Bill and Ken worked like Trojans, as did the carpenters, painters, and others, and I dropped in occasionally to heckle them. The plan and photographs will show you what a super-duper job it turned out to be.

And on the day the work was completed, and the two boys were beaming with satisfaction over a big job well done, I droppen in for a final inspection.

"Ken," I asked, "did you ever see any scale model car retarders?"

"Why, no," he replied.

"Now, just why did you ask that question?" inquired Bill, with a gleam of suspicion in his eye.

"Well," I replied, pointing to a spot in the yard, "I thought maybe we should put a hump here, with a track-scale, and a scale house, and —"

Bill reached for a soldering iron and Ken grasped a hammer. I fled down the fire escape.

Kit Of The Month

By ROY MILLARD

After a long layoff in the Service, Roy Millard has once again taken up Model Railroading as a hobby. Each month he will describe the various problems that confront him and other hobbyists while building up manufactured kits.

ANYONE coming back to the model pike hobby, after a long layoff at the invitation of Uncle Sam and the local draft board finds, as we have, a multiplicity of new kits on the market—along with greater emphasis than ever before on scale realism.

Some of these new kits are in the old tradition; they require all the tools of a semi-pro machine shop. Others can be built on a kitchen table, using a toothpick and a tube of model cement — a little care and patience.

No matter which kind you prefer, you'll be able to get the kit of your choice when you visit your favorite hobby shop. As a matter of fact, if it weren't for our own local model store we would never have gotten started again—simply because of the aforementioned variety.

But, to help out some of the more timid souls, as well as to assist your pocketbook in making the choice, we're writing this column. Each month we'll review the pick of the latest models, re-introduce some of the older ones, pin a mythical medal on the best, and pick out some of the flaws in the not-so-best.

So, here goes, and let it be remembered that it's HO we're talking about, unless otherwise mentioned.

As far as we're concerned, the pick of this month's models is Megow's Pennsy passenger coach, in the medium-priced field. Building this one gave us the most fun we've had in a long time. Plans are full-size, with plenty of detail, and a good instruction sheet. This should make it a cinch for the tyro. The advanced model builder will like the kit for its wealth of realism.

On this kit, which is No. Q27 in the Philadelphia firm's book, follow the instructions and there won't be any trouble. However, you will have to watch out for the steps and diaphragms. The steps come as printed cardboard which has to be cut, shaped, and glued.

Hold your horses and go slowly here. It's best to shape the cardboard carefully. When bending it to make the steps, you might fold the board across the back of a knife to get a sharp crease. Don't try making a shallow cut with a razor-blade; the paper is too thin. Of course, you'll use a minimum of glue or cement to avoid warping, and ditto while painting.

The pasteboard steps will be satisfactory if you use care, but if you're one of the horserace builders who can't wait, we'd advise a visit to the hobby store for plastic or white-metal steps.

As for the diaphragms, great care should be taken with the glue fillets, which are laid on to make the accordion pleats. Glue on coarse thread to create the illusion, or you might try notching ⅛ square balsa.

But, all in all, this kit is by far the best we've tried recently. Oh, yes, one last reminder: Take care with the printed embossed sides. The printing seems to be on foil-coated paper and scratches off quite easily. Normal construction care will do, and worth it, too, for the foil gives an unusually steel-like quality to the sides.

We ran across an HO 60-foot baggage car that is well worth mentioning here. It's a JC model, and one you'll be proud to own and run—if you can build from rudimentary plans.

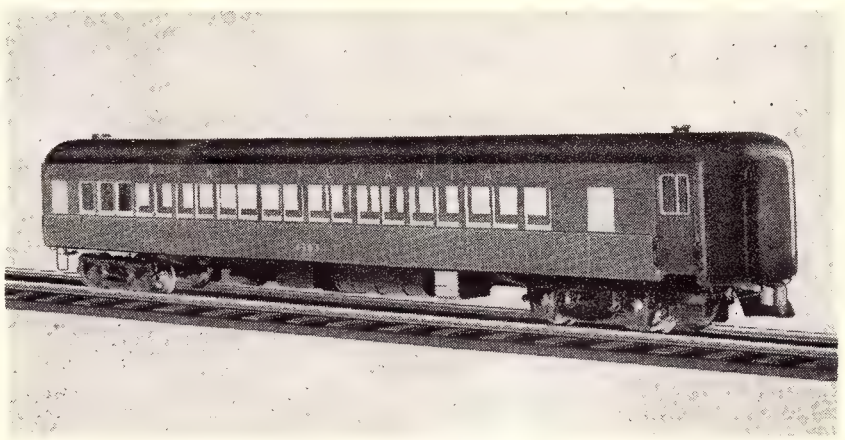
The diagram is drawn smaller than the model and no scale is given. No dimensions are printed in the instructions, and we had to spend a few minutes with pencil and paper to figure out where the truck centers should be located.

It's easy if you're up on your math. For instance, on this model the floor plan measures seven inches, while the floor of the model measures 8⅛". On the plan the truck centers measure in from the ends 1 1/32". By setting up the formula: 7 : 8⅛ :: 1 1/32 : X we find the truck centers to measure in 1¾" from the floorboard ends.

And, on this model's plans there's no place shown for grabirons and steps. This baggage car is modeled on a NYC original and we got a Railway Mail friend of ours to sketch the real thing before we could locate the hardware. F'hevven's sake, though, forget about the steps under the baggage doors, for if you don't you may have trouble swiveling the trucks. The steps will hinder trucks on all but the widest curves.

The best part about this kit is the milled wood strip provided by the JC people for use in building the diaphragms, as well as the embossed paper with which to cover the car ends. his is an inexpensive kit, comes minus trucks, and can be roughed up in the course of an evening. If the tyro wants to try this we suggest that he read the plans very carefully and follow each construction step as outlined.

One last reminder: after you measure the kit floor to locate the truck centers, don't paint the model until you drill a small hole or push in a thumbtack on the centers. The paint may very well obscure your pencil marks otherwise.

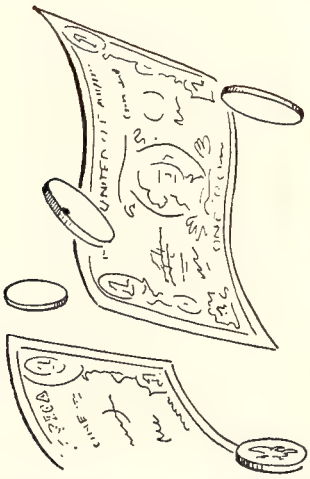


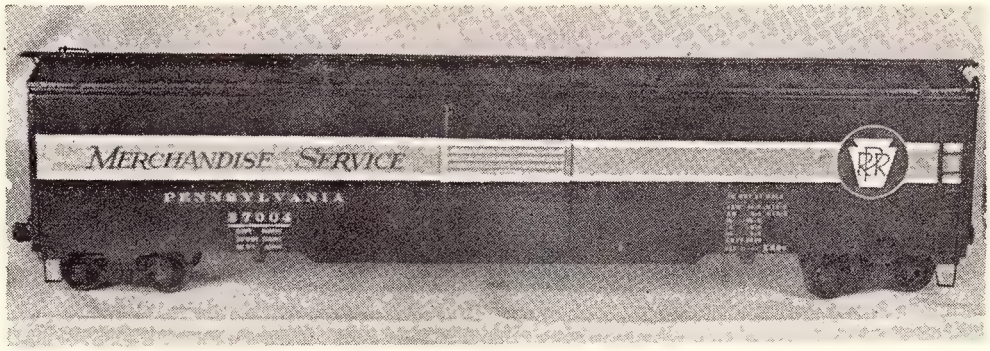
A built up Megow Pennsylvania Passenger Coach, HO gauge

TIP OF THE MONTH: Those of you who find the Varney Docksider too light for tough yard work might do this. Visit a printing plant and scrounge some old linotype metal, preferably slugs about one-inch wide, two inches long, and any convenient thickness. Then, wherever you find space, using cement or any other suitable adhesive, glue in pieces of type metal.

We found room to add weight on the frame up in the boiler and inside the cab. Avoid soldering on additional metal because you may damage the frame.

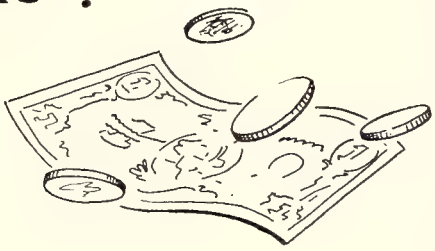
Next month we hope to talk a bit about a Silverstreak kit, and about a switch kit, as well as anything else that may come along.





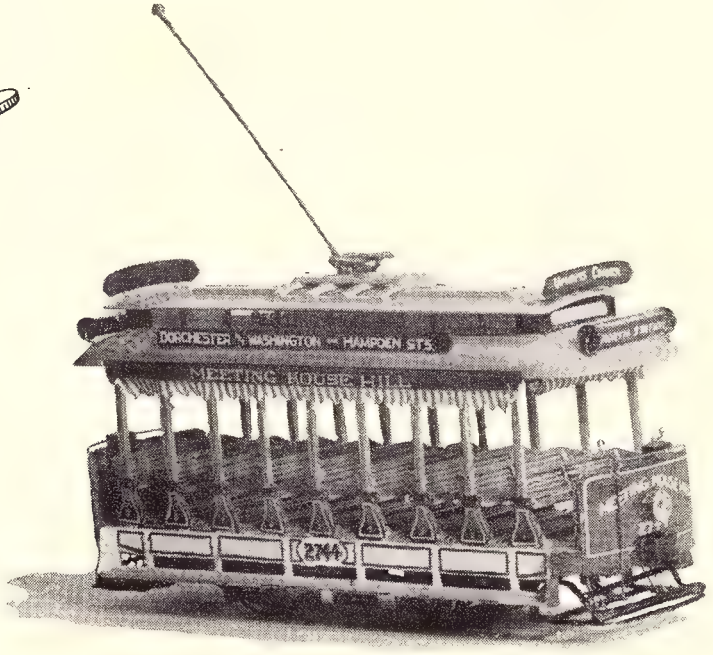
Pennsy Box Car, Class X40B, in HO. This model was built by Leonard Shuffstall of Altoona, Penna. from wood with Athern Roof, ends and doors. All lettering is free hand. With exception of lettering, the model was completed before the prototype was started. Photo by Dr. Paul Good.

WANT THREE BUCKS ?



Your Nabor's Pike

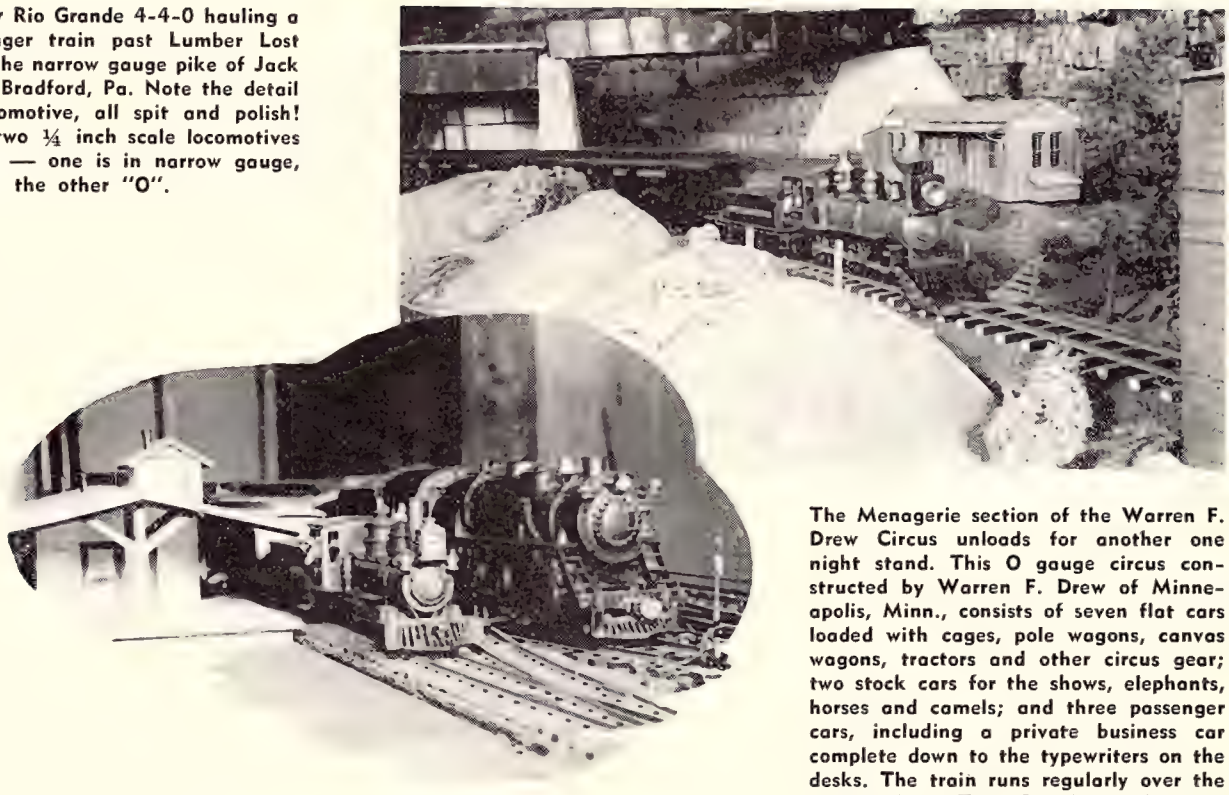
Three bucks — that's what we're paying for both photo and appropriate caption appearing on this page. Two bucks for each photo without caption. Here's a good chance to let your "nabor" see your work and make some easy money in the bargain. Photos are selected on a basis of good photography and reader interest. We do not limit you to some super-detailed model, so don't be bashful—your photo may be the next to appear on this page. Include all pertinent information regarding scale, gauge and all interesting facts. Send material to the Picture Editor, Model Craftsman, Ramsey, N. J. Photos will be returned on request.



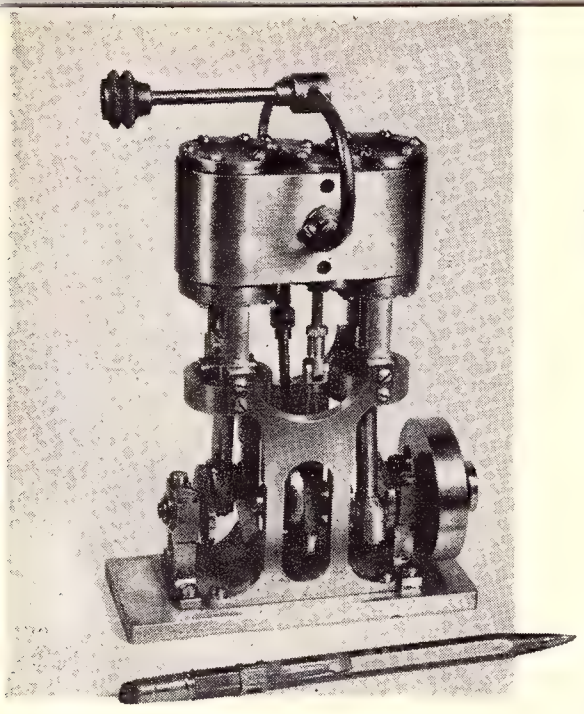
Naturally air conditioned ¼ inch scale model of a Boston nine bench open car. Prototype for the model was built by the St. Louis Car Co. in 1898. The inside of the car features reversible seats, fare clocks, ads running along underpart of monitor (all to scale) glass sides along monitor. This beautifully detailed model was built by L. Bourassa & M. Barry.

Unusual activity in HO gauge. Note the dirty straw in stockcar and the airhorns on roof of truck cab. The license plate is fitted with a stoplight and the truck also boasts a windshield wiper. The truck is made of cardboard and wood, bits of metal served as a bumper and radiator grill. The trailer is an anchovy can. All this in HO by Paul Dreykus of Newark, N. J. Photo by David Winans.

A Denver & Rio Grande 4-4-0 hauling a fast passenger train past Lumber Lost station on the narrow gauge pike of Jack Alexander, Bradford, Pa. Note the detail on the locomotive, all spit and polish! Below are two ¼ inch scale locomotives at junction — one is in narrow gauge, the other "O".



The Menagerie section of the Warren F. Drew Circus unloads for another one night stand. This O gauge circus constructed by Warren F. Drew of Minneapolis, Minn., consists of seven flat cars loaded with cages, pole wagons, canvas wagons, tractors and other circus gear; two stock cars for the shows, elephants, horses and camels; and three passenger cars, including a private business car complete down to the typewriters on the desks. The train runs regularly over the tracks of the Twin City Model Railroad Club. The tent in the background is accurately scaled down to the last rope. Photo by Bob Kruse.



Vertical Twin Cylinder Steam Engine

By ALBERT V. LINDSAY

PART I

THIS little engine is a very interesting project for the live steam enthusiast who desires to build an efficient, yet compact engine. It is a neat little twin cylinder, single expansion, non-condensing, vertical type engine, ideal for the beginner or veteran alike. This engine is a veritable power-house: it develops approximately one-half horse power and is only 5⅝" x 4¼" x 1¾" overall. Mr. W. J. Kloppenberg of University City, Missouri was the builder of this fine model described here. Under a pressure of 50 pounds, he has run the model at 3000 R. P. M.

Generally, this type of engine is used for hoisting or steam shovel work as it is very compact and it has no "dead-center." This last feature provides smooth power which is positive at all times.

Although this model is a single expansion engine, it is quite similar in appearance to the double expansion engine which was formerly used at electrical power plants to run the generators. This reciprocating type of engine has now been replaced by the steam turbine because of the finer speed control of the turbine which maintains the cycle of the alternating current that is generated.

The logical first step to take in the construction of this model would be to procure the materials required. A list of these materials has been made up in conventional form and appears below. Each part has been given a detail number to correspond to the detailed drawings of that particular part.

In addition to the parts listed in the stock list, the following hardware will also be required:

Filister Head Screws

#6-32 x 7/16" long	12 req.
#6-32 x 5/16" long	8 req.
#2-56 x ½" long	8 req.
#2-56 x ⅜" long	12 req.
#2-56 x 5/16" long	16 req.
#2-56 x ⅛" long	8 req.

Miscellaneous

#6-32 x 3/16 Set Screw	1 req.
#5-40 Texagon Nuts	2 req.
#000000 Taper Pins	2 req.

A very distinct advantage in this model is that no castings are required. Castings are usually very hard to obtain and are sometimes quite expensive. All of the materials used in the construction of this model are readily obtained, many of them will probably be found in your shop scrap heap.

After the materials are on hand, let us consider the tools required. A lathe and drill press are quite essential and a milling machine or milling attachment for the lathe will save much filing and will produce a better and neater looking finished job. You will also require #2-56 and #6-32 taps, a #5-40 tap and die, a #000000 taper pin reamer and the following drill sizes: #50 (.070), #38 (.1015), #36 (.1065), #32 (.116), #30 (.1285), 1/16", 3/32", ⅛", 5/32", 9/32", 5/16", 11/32" and ⅝".

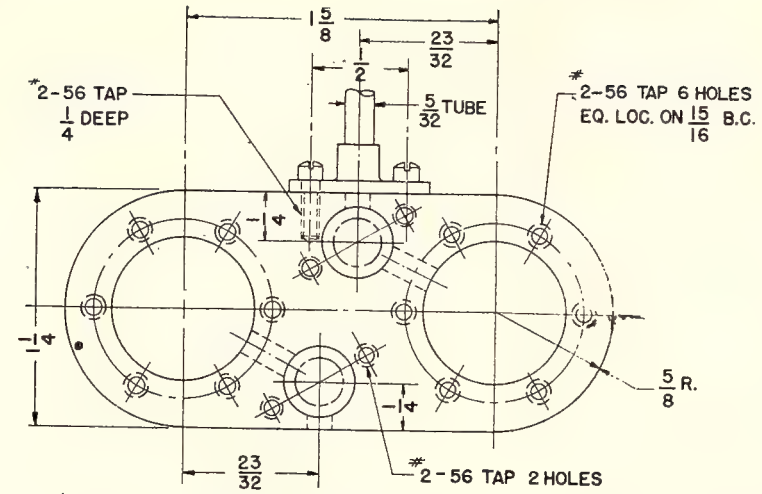
If you have, or can obtain, the necessary reamers, it would be best to ream all the bored holes, such as the cylinder & piston valves, bores, etc., because of the finer finish and uniformity of the bore obtained.

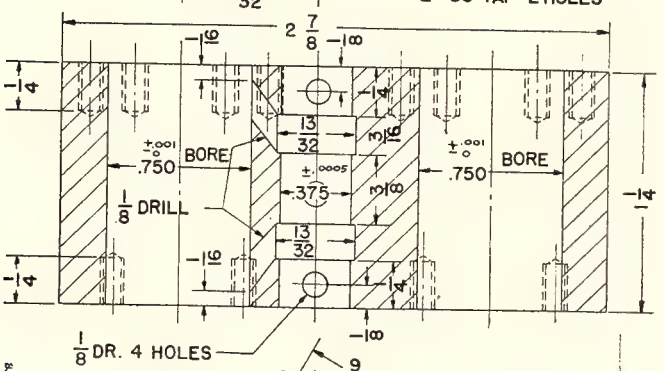
At this point, let me stress the fact that the closer the dimensions are held, the less adjustment and fitting will be required at the final assembly.

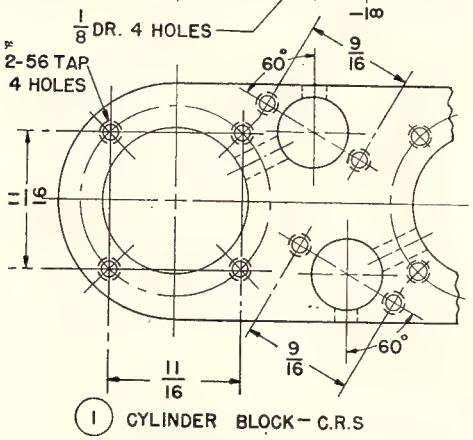
Start your machining operations with the Cylinder Block (detail #1). The ¾ inch bores should be uniform through the entire length of the block and must be square with the upper and lower faces, especially the lower face, otherwise the piston or rod

STOCK LIST

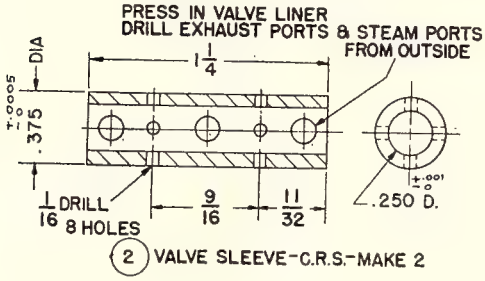
Detail #	Req'd. No.	Name	Material	Approx. Size (Allow for finish)
1	1	Cylinder Block	C. R. S.	1¼ x 1¼ x 2⅞
2	2	Valve Sleeve	C. R. S.	⅜ diam. x 1¼
3	2	Cylinder Head	C. R. S.	1⅛ diam. x 3/16
4	2	Cylinder Head & Cross Guide	C. R. S.	⅛ diam. x 1 1/16
5	2	Piston	C. R. S.	¾ diam. x 3/16
6	2	Piston Rod	C. R. S.	3/16 diam. x 1⅞
7	2	Cross Head	Bronze	¾ diam. x ⅝
8	2	Wrist Pin	C. R. S.	⅛ diam. x ⅝
9	2	Stuffing Box	C. R. S.	¾ diam. x ¼
10	2	Upper Steam Chest Head	C. R. S.	⅛ x ⅜ x 1/16
11	2	Lower Steam Chest Head	C. R. S.	3/16 x ⅜ x 1/16
12	2	Piston Valve	Bronze	¼ diam. x 1¾
13	2	Valve Stem, Toggle Joint	C. R. S.	¼ x ¼ x ½
14	2	Toggle Joint Pin	C. R. S.	⅛ diam. x ¼
15	2	Eccentric Rod, Toggle Joint	C. R. S.	¼ x ¼ x ⅜
16	2	Eccentric Rod	C. R. S.	⅛ diam. x 1¼
17	2	Eccentric Strap	Bronze	3/16 x 1 5/16 x 1 7/16
18	2	Side Frame	C. R. S.	3/16 x 2¼ x 2 1/16
19	2	Main Bearing Pillow Block	C. R. S.	¼ x ⅞ x 1
20	2	Main Bearing Cap	C. R. S.	¼ x ¼ x ⅞
21	2	Main Bearing	Bronze	7/16 x ⅜
22	2	Crankshaft	C. R. S.	1⅛ diam. x 2 3/32
23	1	Eccentrics	C. R. S.	1 x 1¼ x 1¼
24	2	Connecting Rod	C. R. S.	¾ diam. x 1¾
25	2	Bearing Cap	C. R. S.	¾ diam. x ¼
26	2	Conn. Rod Bearing	Bronze	⅜ diam. x ⅜
27	1	Engine Base	C. R. S.	¼ x 1¾ x 4⅛
28	1	Flywheel	C. R. S.	1¾ diam. x 5/16
29	2	Intake Flange	C. R. S.	¾ diam. x ¼



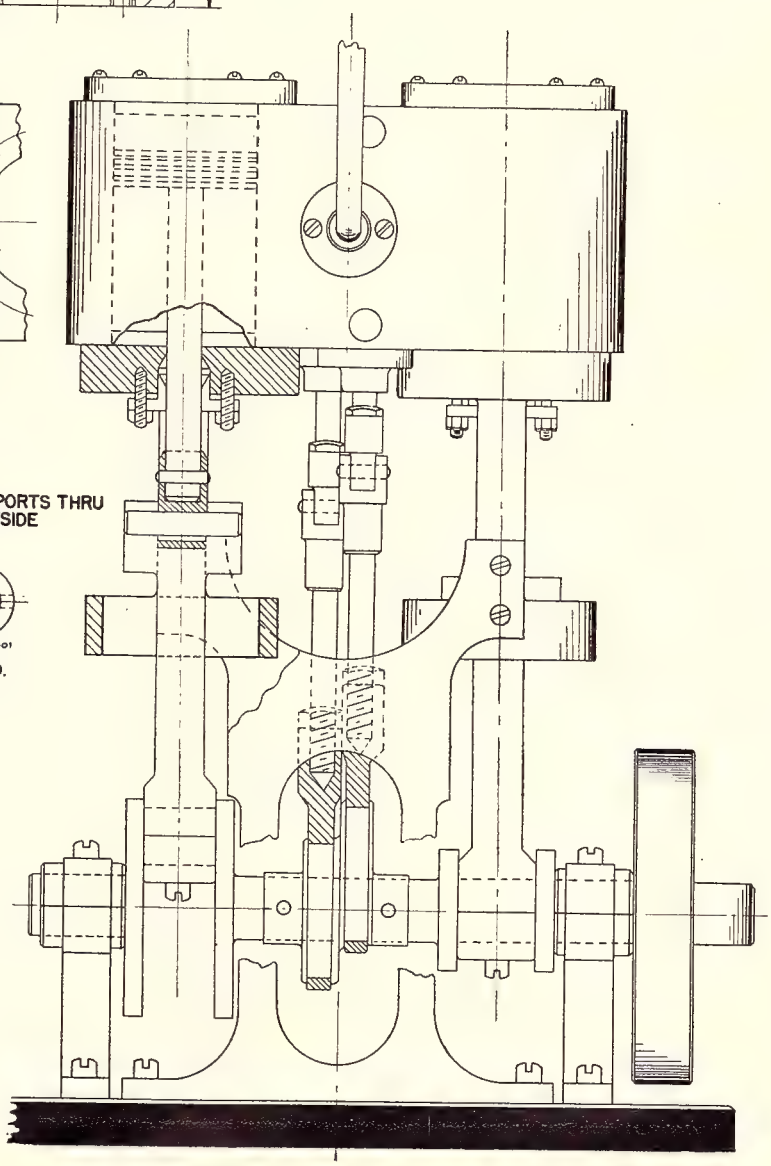




(1) CYLINDER BLOCK – C.R.S



(2) VALVE SLEEVE – C.R.S. – MAKE 2



will bind at some point in its stroke. The bores for the valve sleeves should be smooth and the $\frac{3}{16}$" grooves should be carefully burred so that the valve sleeve will fit snugly but not become scored when it is pressed in the bore. The angular holes for the steam port openings should also be carefully burred to prevent scoring of the piston. It would be advisable to bore or ream the inside of the valve sleeve after the sleeve has been pressed in and the intake and exhaust port holes drilled.

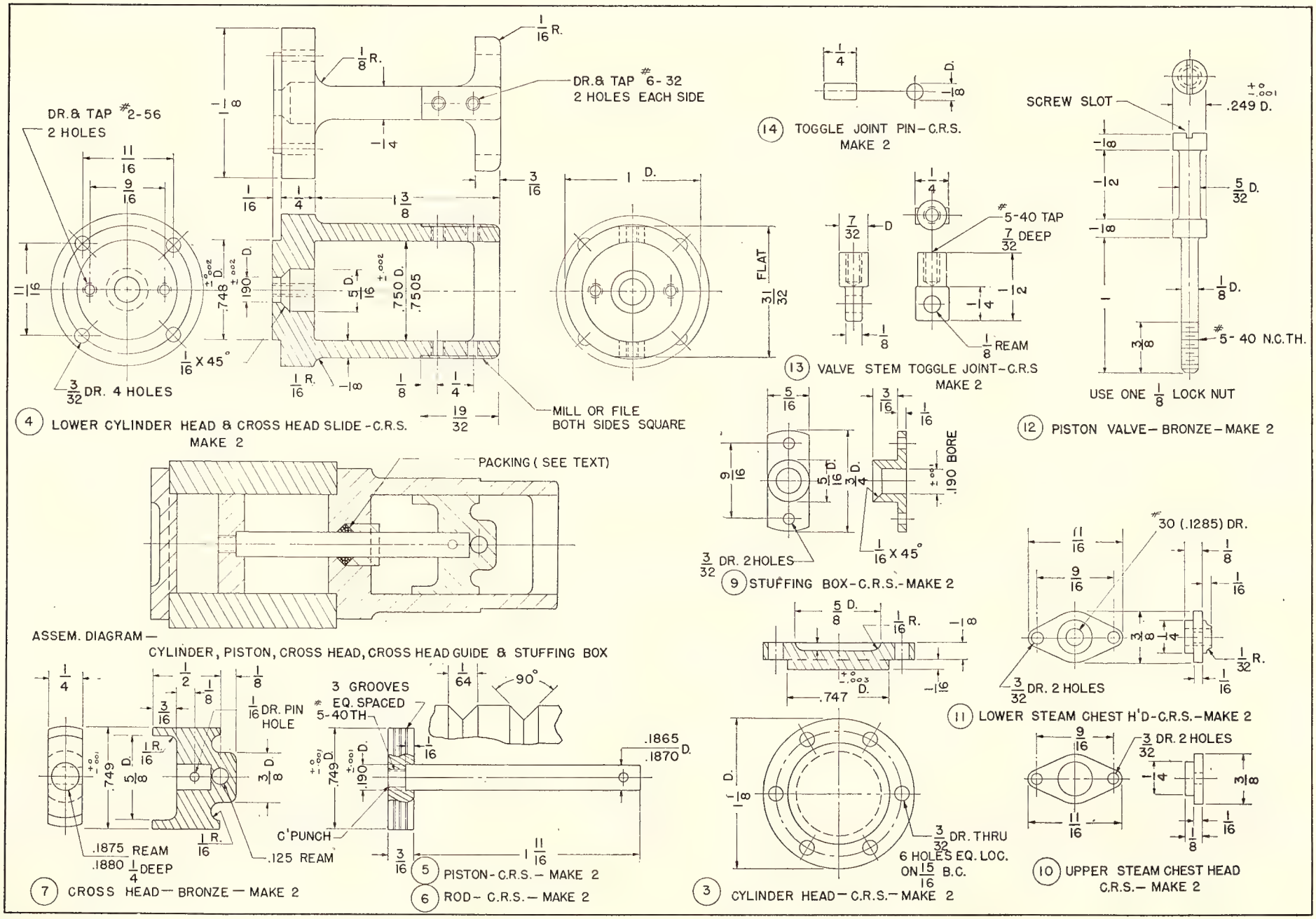
The location of the tapped holes for the cylinder heads and steam flanges can be put off until you are ready for assembly at which time they can be located directly from the mating parts, thus assuring a better fit. The upper and lower faces of the cylinder block should be smooth and the flat and the tapped holes countersunk slightly so that the cylinder heads, flanges, etc. will seat properly. This will prevent excessive steam leaks.

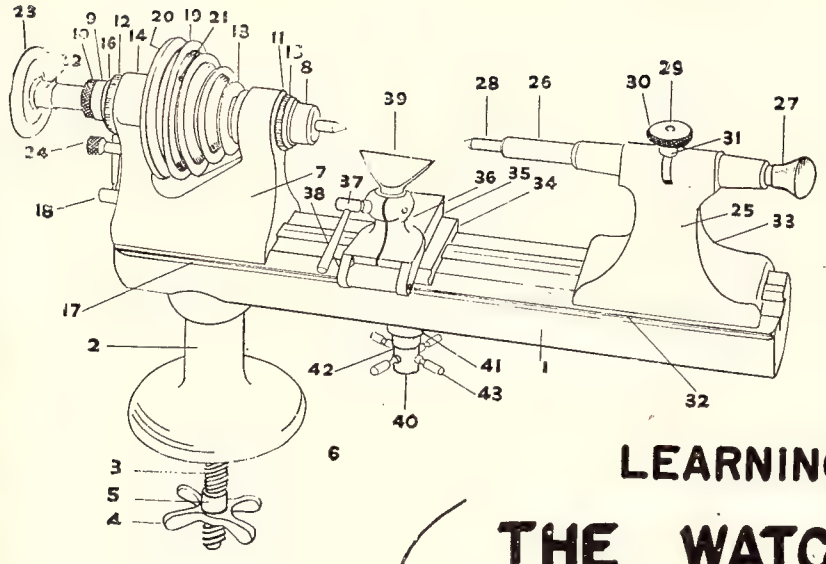
The upper cylinder heads (detail #3) need no explanation other than to keep the surface, which faces the cylinder block, smooth and flat so that a tight fit can be maintained.

The lower cylinder heads and cross head guides (detail #4) require more careful machining. As with the upper head, a tight fit is required against the block. A very important point, in making this part, is to keep the .748 plus or minus .002, the .190 plus or minus .002, the .750 plus .002 minus 0 and the $\frac{5}{16}$ diameters concentric and square with the face of the cylinder block so that the piston, piston rod and cross head will travel directly in line.

The piston (detail #5) should be turned smooth to within .001 of finish size. The

(*Continued on page* 45)


DR.& TAP #2-56
2 HOLES
DR.& TAP #6-32
2 HOLES EACH SIDE
3/32 DR. 4 HOLES
1/16 X 45°
MILL OR FILE
BOTH SIDES SQUARE
4 LOWER CYLINDER HEAD & CROSS HEAD SLIDE-C.R.S.
MAKE 2
14 TOGGLE JOINT PIN-C.R.S.
MAKE 2
13 VALVE STEM TOGGLE JOINT-C.R.S
MAKE 2
#5-40 TAP
7/32 DEEP
1/8 REAM
SCREW SLOT
.249 D.
#5-40 N.C.TH.
USE ONE 1/8 LOCK NUT
12 PISTON VALVE-BRONZE-MAKE 2
PACKING (SEE TEXT)
ASSEM. DIAGRAM-
CYLINDER, PISTON, CROSS HEAD, CROSS HEAD GUIDE & STUFFING BOX
9 STUFFING BOX-C.R.S.-MAKE 2
3/32 DR. 2 HOLES
.190 BORE
#30 (.1285) DR.
11 LOWER STEAM CHEST H'D-C.R.S.-MAKE 2
3 GROOVES
EQ. SPACED
#5-40TH
1/16 DR. PIN HOLE
.1865
.1870 D.
C'PUNCH
.125 REAM
.1875 REAM
.1880 1/4 DEEP
7 CROSS HEAD-BRONZE-MAKE 2
5 PISTON-C.R.S.-MAKE 2
6 ROD-C.R.S.-MAKE 2
3/32 DR. THRU
6 HOLES EQ. LOC.
ON 15/16 B.C.
3 CYLINDER HEAD-C.R.S.-MAKE 2
10 UPPER STEAM CHEST HEAD
C.R.S.-MAKE 2



LEARNING TO USE THE WATCHMAKER'S LATHE

By WILLIAM SCHOPP

THE recent series in the Model Craftsman on using a modelmaker's lathe should have given you a good idea of how to use a small metal turning lathe, especially if studied rather than read, and put into practice when possible. The watchmaker's (or jeweler's) lathe is a different proposition, however, for a modeller who has the use of one either by purchase or "trackage rights". The compound tool rest is usually not standard equipment and the tail-stock, while a part of the lathe as bought, is very seldom used. On a watchmaker's lathe, all turning, drilling, tapping, etc. is done free-hand, the cutting tool being held against an adjustable T-rest, reminiscent of a wood-turning lathe.

The price of a watchmaker's lathe, new, may cover a wide range, with a hundred fifty dollars constituting a fair average for a complete lathe (bed, headstock, tail-stock, T-rest, motor, foot-pedal, and an assortment of chucks). Used lathes may often be obtained by judicious inquiry among jewelers for considerably less than that figure. In buying a used lathe, watch should be kept for obvious damage to parts, particularly composition pieces such as the handle to the draw-in spindle, and the stepped pulley. Usually such damage, unless major, does not interfere with the operation of the tool, nor does a small amount of rust on the outboard end of the lathe bed. The condition of the bearings is quite important, and while it can be accurately ascertained by dismantling the headstock, the following test will serve where that is not practical. Tighten a chuck in the headstock with the draw-in spindle. Now with the headstock locked to the bed, try to work the draw-in spindle back and forth. The end-play should be so slight as to be almost non-existent, and, owing to the cone shape of the bearing, no end-play infers no side-play so the lathe will be as well centered as the chucks permit. But, while the headstock is without end or side play, it should also be free to revolve without binding, considering of course that even with lubrication there is a large amount of well-lapped *surface* involved in each bearing.

The motor, of reversible type, is controlled by a foot-pedal such as is used for an electric sewing machine, with four or five speeds. The belt between motor pulley and step-pulley on the lathe is usually round raw-hide linked together with a brass-wire staple. Spring, plastic and other belts are sometimes used.

The chucks, which to a machinist are collets, are numbered by tenths of a millimeter so that #10 will take 1.0 mm. stock, #16 will take 1.6 mm. stock and so on. For model work, chucks 8, 16, 24, 32, 40, 48, (47 is commoner), 56 and 64 will be a good assortment since they correspond pretty well to $\frac{1}{32}$", $\frac{1}{16}$", $\frac{3}{32}$", $\frac{1}{8}$", $\frac{5}{32}$", $\frac{3}{16}$", $\frac{7}{32}$" and $\frac{1}{4}$". Chucks larger than 47 or 48 will not take round stock all the way through, but are stepped so that perhaps $\frac{1}{2}$" of the rod may be held in the chuck. A wax or cement chuck is threaded internally so that a piece of brass rod or a disc (as in fig. 8) may be semi-permanently screwed into it. Pieces then too large or too awkward for a regular chuck may then be cemented to the brass with jeweler's cement or shellac. A modeller will find one rod and discs of two or three sizes valuable. Wheel chucks are internally stepped chucks as indicated in fig. 7, which come in sets of five that cover all wheel sizes in their range.

Also available is a large three-jaw self-centering chuck which will take pieces up to three or four inches in diameter. These are obtainable with jaws reversible, and for inside or outside holding only. For extreme accuracy, separate chucks for inside and outside holding are desirable. A similar chuck with six jaws is called a bezel chuck and is not particularly adapted to model use since the depth of the grip of the jaws is too shallow. Faceplates on which watch plates can be held with three dogs can be bought for about thirty dollars as can four jaw independent chucks.

The make of the lathe is not too important particularly if it is a new one. If it is an old one, even if the maker is not still in business, parts from other makes can usually be adapted. The type of chuck the lathe takes is important, unless a wide variety is included in the initial purchase. The standard chuck is called a W.W. type (standing for Webster-Whitcombe). It is made from $\frac{1}{2}$" steel rod, the shank is 5/16" in diameter and the thread is 17/64"-28. On the W.W. chuck, the flare at the business end is at an angle, while on the Moseley type chuck (which might be called a second standard) the flare is on an arc. Both W.W. and Moseley also come in a large or Magnus size, which,

LATHE BODY
1—Bed
2—Base
3—Base Bolt
4—Wing Nut
5—Washer
6—Hex Nut

HEADSTOCK
7—Frame
8—Spindle
9—Spindle Loose Bearing
10—Adjusting Nut
11—Front Bushing
12—Rear Bushing
13—Front Inside Oil Shield
14—Rear Inside Oil Shield
15—Front Outside Oil Shield
16—Rear Outside Oil Shield
17—Hold Down Anchor Bolt With Adjusting Nut
17A—Conical Spring
18—Eccentric With Handle
19—Composition Four Step Pulley With Core
20—Pulley Core
21—Pulley Set Screw
22—Draw-in Spindle
23—Draw-in Spindle Knob
24—Index Pin

TAILSTOCK
25—Frame
26—Spindle
27—Spindle Knob
28—Pointed Center
29—Spindle Clamp Ring
30—Clamp Ring Nut
31—Clamp Ring Washer
32—Hold Down Anchor Bolt With Adjusting Nut
32A—Conical Spring
33—Eccentric With Handle

SWING REST
34—Bed Plate
35—Slide Shoe
36—Tool Post
37—Clamp Screw With Handle
38—Hinge Pin
39—T-Rest
40—Shoe Bolt
41—Shoe Bolt Washer
42—Shoe Bolt Spring
43—Shoe Bolt Wing Nut

while they would be better for model work, are more than twice as expensive as regular chucks and much harder to obtain. A W.W. type chuck of good grade now sells for about $1.50 while very accurate ones, probably too good for model work, cost $3.60 each.

The principal cutting tool used on a watchmaker's lathe is called a graver. This is a square piece of tempered steel, about six inches long, with the business end ground off at an angle as shown in fig. 1. It is thrust into a cylindrical handle to prevent the tang from gouging your palm when using the tool. (Mushroom shaped handles are used on gravers, used in hand engraving and are of little use in lathe work). Gravers as purchased require sharpening. The two longest edges should be made smooth by rubbing on an oilstone in a direction parallel with their cutting edges. Then the writing end of the graver should also be ground down on an oilstone until the point is *really* a point when viewed through a jeweler's loup. A standard test is to see if the point will catch on a finger nail with no pressure other than its own weight. The top face of the graver should be a parallelogram with equal sides; that is, a mashed over square. A very small difference in the length of the two cutting edges is permissible, but a little thought will show that as the parallelogram approaches a rectangle, the value of the cutting edges diminishes. The triangular area enclosed by the two cutting edges should be on one plane, while the remainder of the parallelogram may be on the same plane but doesn't have to be since it does no cutting. The graver point is sharpened by drawing it back and forth on an oilstone in a line determined by the two equal edges of the square of the graver. They may also be sharpened on a fine grained grinding wheel, but should be frequently dipped in water to cool: discoloration of the steel indicates softening.

Gravers made of high-speed steel, while not of much value to the watchmaker because they don't keep a good point, will do for a modeller since they retain their cutting *edge* for a longer time than regular gravers. Carboloy gravers are valuable for turning blued or tempered steel but since most modelling work will be turned from brass or mild steel, the large investment for carboloy cutters, and the diamond lap needed to sharpen them, is questionable.

The lathe should be mounted from six to eight inches back from the edge of the work bench and toward the lefthand side. For model purposes, where the lathe will be used for long stretches of time, the motor should be mounted at the back of the bench with its pulley in line with the lathe pulley. Slight adjustments can be made by moving the headstock. Connect up the foot-pedal, the belting, oil the motor and lathe bearings with household oil and test the lathe out by running it at various speeds.

The first lesson begins by chucking up a piece of heavy brass wire, $\frac{5}{32}$" or larger with about an inch protruding from the chuck. The object of the first lesson is to cut a lot of shavings, but first the rod must be trued. Large errors can be corrected by tapping with a light hammer, then the highspots must be knocked off. This can be accomplished by holding the graver cutting edge parallel with the work and running the lathe at high speed. A shiny area will indicate a high spot knocked off and when the whole circumference is shiny the rod should be true. Very small cuts must be taken or the rigidity of the graver will knock the rod out of true again.

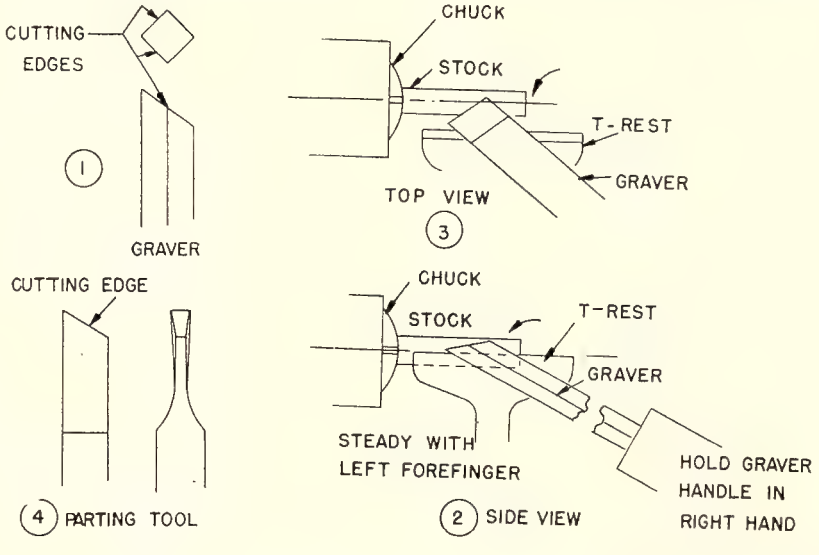
To cut shavings, hold the graver handle in the right hand and steady the end of the graver against the top of the T-rest with the left forefinger. The T-rest is as close to the rod as possible and slightly below the center line. Notice that the point of the graver is not used in cutting, only the extreme edge. You will have to maneuver the graver around until you hit the right angle for shavings to come off as the tool is moved slowly back and forth along the work. Figs. 2 and 3 should give you a good idea, although the exact angle you must hold the graver must be found by you alone. Be sure you run the lathe slowly and move the graver slowly. Get a good pile of shavings, some of them three or four inches long before you dare proceed to the next lesson which is the same thing on soft steel drill rod. Some of the shavings will make good HO gauge chains.

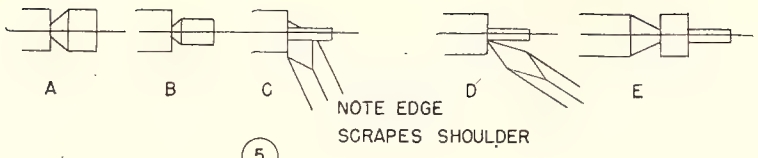
In severing a completed or spoiled turning from the rod, the graver may be used as indicated in fig. 5-e. The wedge shaped opening cut in the rod must be kept at such an angle that the graver does not jam into the V where it will chatter or not cut. A jewelers saw may be used for parting, revolving the lathe in such a direction as to catch the teeth. Fig. 4 shows a cutting off tool ground from an old graver, or filed from square steel, then hardened by heating red and plunging into cold water. Notice that it is narrower just back of the point than at the point, so that it does not jam into the slot it cuts in the rod being severed.

The next lesson is making square shoulders. In watch work it is essential that such a shoulder as shown in fig. 5d be absolutely square with the projecting pivot since the slightest misalignment of either or the presence of a filet in the corner will cause mysterious troubles in a watch. In model work such perfection may not be needed, but the technique should be learned so that you can make your model work as perfect as you want to. The first step in making a square shoulder is to slice straight in with the graver as shown in fig. 5a. Instead of making this waist down to the size of the finished pivot, take two or three steps. The pivot is then turned down as in 5b. Now the shoulder, chances are, will not be perfectly flat, so it must be scraped with the edge of the graver as shown in 5c. The edge of the graver is fitted under the pivot, into the corner, and the point is on the far side of the pivot. Most of the scraping or cutting is done with the back part of the cutting edge, although the graver may be slightly tilted one way or the other to smooth out the shoulder. So far the point of the graver has not been used. Finally, the very point of a newly sharpened graver is used to flick any remaining filet out of the corner. All this turning is done at a slow speed. In fact high speed on the jeweler's lathe is used mainly for trueing up, polishing, or very rough work.

Making of good square shoulders is not easy, either in brass or steel; in fact it is one of the early stumbling blocks for those who learn to use the lathe in watchmaking schools. There is a very great tendency to have the shoulder slope in or out, and to have the pivot slope one or both ways or even resemble a Coca-Cola bottle. All turned surfaces should have the turning marks all but unnoticeable to avoid too much polishing. If the pivot must be polished (in steel) use a triangular Arkansas stone slip. Tempered steel can be further polished with abrasives such as oilstone powder and diamantine.

When it is desired to make a center in the end of a rod or other piece for purposes of drilling a hole, the end must





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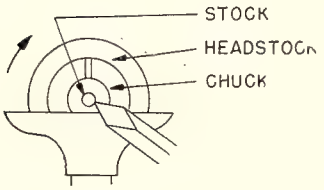

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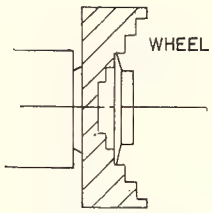

7 CUT-AWAY VIEW OF STEP CHUCK

first be faced off smooth with the graver. On a large lathe a center would be locked in the tailstock chuck and slowly pushed into the revolving rod to find and mark a center. Since we don't use a tailstock much in our watchmaker's lathe, the center must be found with a graver free-hand as indicated in fig. 6. The motor is reversed, the T-rest set across the bed close to the end of the rod, and the graver held with its handle toward the rear of the lathe bed. Examination with a loupe while the lathe is turning will disclose a dead spot where there is no rotation in the center of the chucked up rod. Endeavor to hit this dead spot with the sharp point of the graver. Once located, the truth of the "center" may be checked by thrusting the point of a sharp needle into the slight V cut. If, when the rod revolves, the needle wiggles, it is not a true center, either a bad point on the graver has made a flat bottom or an inaccurate stab at the center has resulted in a tit in the middle of the V. Make the V no larger than necessary to start your drill. Finding centers thus is not an easy lesson to learn, but is more accurate than any simple adaptation of the tailstock principle as used in larger lathes.

Once a center is found, to drill a hole, hold the drill in a pinvise instead of a tailstock. Your hand will give enough to prevent too easy breakage of the delicate drill. Any drill may be used, although watchmaker's often use flat drills which may be home made or bought. Pivot drills can be bought for around a dollar a dozen, ranging in size down to .04" or .1 mm., somewhat smaller than a #80 twist drill. Needless to say such fine drills are very delicate and must be frequently sharpened, but will do good work. Drills are sharpened while held in a pin-vise, on a small Arkansas stone slip. Taps are also held in a pin-vise when used.

When it desired to work on a piece which is too large for the largest chuck, several schemes may be resorted to. A set of five wheel chucks will take care of discs up to about an inch in diameter, grasping them by their edges which are presumed to be truly circular, Fig. 7 shows a wheel held in a step-chuck. The center could then be found and drilled for an axle. The best procedure here would be to drill the hole a little too small, then open it out with a tapered pentagonal cutting broach held in a pin-vise until it was a force fit for the axle.

A piece too large or wrongly shaped for a wheel-chuck may be cemented to a wax chuck disc as shown in fig. 8. The brass is heated back from the end with the flame from a ½" wick alcohol lamp until stick shellac or jeweler's wax will adhere to the end. The lathe must be kept in motion, but very slowly or the wax will fly off in your face. The part to be worked on is pushed into the hot wax centered only approximately by eye. Accurate centering can be done by bringing the T-rest up within about ½" of the piece cross-ways and resting a piece of pointed peg-wood or ⅛" dowel on it. The point is pressed against the internal opening which is desired for the center. Force is provided by the right hand about six inches out, while the fulcrum is established by the left forefinger pressing the peg down on the top of the T-rest. A little steady pressure while the wax is hot will center the piece, and as the wax cools the part is cemented in place. The truth may be tested by removing the right hand from the peg and noting the amount of wobble if any at that end of the peg. There should be none.

If there is no opening to center by, then "see note" on fig. 8 indicates how a smooth stock such as a ruler may be held against the outside of a round piece while it is revolving in wax in the lathe.

When it is desired to open up a hole, as in the wheel in fig. 7, for some purpose that requires greater accuracy than is

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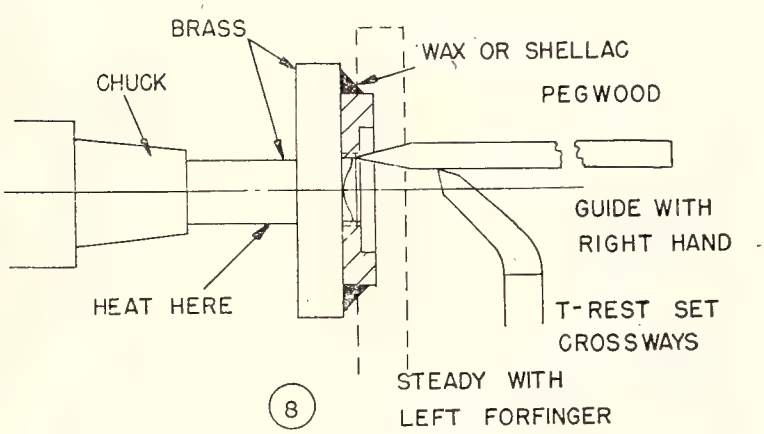

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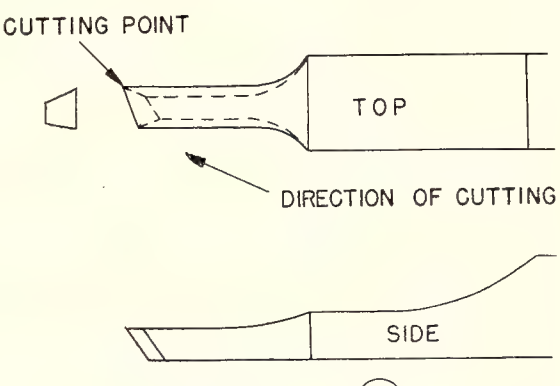

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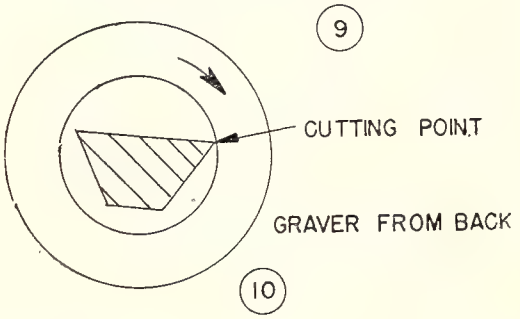

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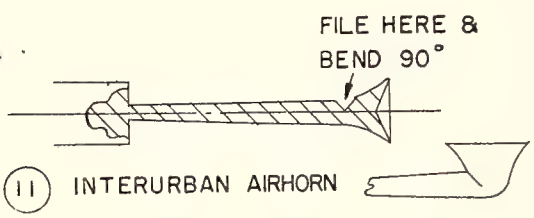


11 INTERURBAN AIRHORN

GETTING STARTED

PART TWO

By JOHN R. BARKLEY

THIS is really starting out to be an ideal day for duck hunters and model railroaders. Yes, it rains here in sunny California on occasion and you know it is probably more of a blessing to model railroaders than a lot of other people, such as golfers and tennis players. We can use the time ordinarily consumed in watering the lawn, etc., very profitably in the shop. Then, too, it furnishes a good alibi for not weeding the flower beds and painting the outside of the house. And, of course, everyone knows that no painting of any kind should be done during such weather due to the excess humidity which causes the paint to "blush." So I won't have to paint the dinette today, even if it is my day off, my wife having seen the indisputable logic of my verbose argument.

That brings to mind one of the first things a successful model enthusiast has to do — that is — to get the wife on your side. It is not a difficult task if you go about it right, however, it is an ever continuing campaign. You must be a good salesman and a good salesman, in his sales talk, does not dwell upon the benefits of the sale to himself, but constantly reminds the prospective customer of the fact that the commodity is something of great and indispensable value to the buyer. You will meet new people in this hobby and you will find that in model railroading, social barriers are down and bank presidents will listen with rapt attention to a clerk or truck driver explain the intricasies of a new type switch machine or a simpler, easier way of installing track leads. This phenomenon is actually more true in model railroading than any other hobby in which I have engaged. Most of the men you will meet also have wives or girl friends so give the ladies a chance to meet each other and get acquainted and you will be surprised at the added pleasure which will result from this social activity. When a friend comes over some evening to help you lay track, invite his wife. The girls will be glad to have coffee and sandwiches ready after a strenuous two hours of track laying and possibly a round of bridge will top off the evening in grand style for all parties concerned.

In this installment, I am going to give you a suggested list of tools to be used in model building. These are, for the most part, inexpensive, but very handy. First, I will list the tools and then try to explain just how they are used in building a model railroad empire.

Model Knife	Fine sandpaper
Needle nose pliers	12 inch scale
Model cement	4 inch square
Pinpoint dividers	Files
Small vise	Bank pins & brads
Scriber & pin punch	Paint
Brushes (camel hair)	Conversion scale
Combination Screwdriver	

Those listed are fairly essential. Of course, there are other tools which make the work easier and they will be discussed later on, but these will give you a fairly good start. To begin with, the model knife is almost indispensable. It is a handle made to hold specially shaped blades for cutting wood or cardboard. The blades are quickly attached and are of various shapes and sizes. This tool can be purchased either in the inexpensive model for a dollar or less or in the deluxe model in a box with many blades and a fancy handle. The blades are razor sharp and cut cardboard clearly without burring.

Get the small size needle-nose pliers. They are used for holding small parts, installing grab iron on box cars, assembling wood body parts with small pins and tiny nails or brads. One of the tools you will use most frequently. Cost — from a dollar up.

Model cement — get the quick drying kind that comes in small tubes. It is sometimes called model airplane cement. Cost — ten cents for small tubes.

Pin-point dividers. These are used for spacing and marking off, scribing, etc. Especially useful for locating hand rail and grab iron holes. This can be done very exactly by setting the dividers to the exact width of the two joints of the grab iron and then pushing the dividers into the car side. Cost — about seventy-five cents. Be sure to get the small size dividers.

Vise — Desirable but not absolutely essential at first. Very handy for holding metal parts for filing. Also useful in holding wood parts for sawing or planing, etc.

Scriber and pin punch. Like a small ice pick, it is used for locating holes for mounting the trucks under a car, making starting holes for small nails, screws, etc. Also scribing lines on metal or wood parts. You may make these out of tool steel or piano wire, mounting them in a suitable wood handle or a piece of lucite, or they may be purchased. The best of all are dental tools. I got a half dozen from a dentist, gratis and they are made of the best steel obtainable. I have several different sizes from a small needle to a shingle nail. They are very handy tools and are certainly used a lot.

Brushes — Get several different sizes, the largest you will need will be a half inch wide. Camel hair is preferred. Cost from 15 to 35 cents.

The sandpaper should be very fine such as "00." The 12" scale is of course used for laying out work, cutting cardboard straight with the model knife (don't use scissors for this). The four inch square is very useful in squaring up car sides and ends, it costs $1.50.

Files — you will want an assortment of these for coarse work, also fine ones for finishing. Fine Swiss pattern makers files are swell, but fairly expensive in a set, however you will not need all the various shapes. Individual ones may be purchased at your hobby shop for 35 to 50 cents. War surplus stores have good bargains in new files in the larger sizes.

Bank pins, so called by hobbyists, are very much like dress makers pins except they are very short and a little smaller. The ¼ and ½ inch sizes are most useful. You will also find many uses for small nails and brads in assembling wood car bodies and the various way side structures.

Conversion scale for the gauge you will be building or modeling in is a must. This scale gives the measurements in inches, also in millimeters in the smaller gauge and,

best of all, is marked off on one side in *scale feet.* For instance, if you are laying out a car side in HO gauge which is 3½ millimeters to the foot and the car side is forty feet long, you don't have to figure out 140 millimeters, but simply lay the scale down and mark from 0 to 40 feet. It may be purchased at the hobby shop in either stainless steel or card board. It costs from ten cents to one dollar.

A jewelers type combination screwdriver is ideal. It has several different size bits. get two or three different small ones.

Paint — I have left this important item to be discussed last as it will take more "discussin and cussin" than the others. First of all you will no doubt make the major decision as to whether your models will be spray painted or brushed by hand. If you already have a good spray gun, then by all means use it in painting your models as excellent results can be obtained by this method with fast drying lacquers. For those not so fortunate who still want to use the spray method, there is an inexpensive little gadget on the market that has a hose that connects to the spare tire on your automobile, using that pressure to actuate the spray gun. I had one that was used for five years and painted many locomotives and cars getting very good professional looking paint jobs. I don't know what the price is at this time, but two or three dollars should cover it.

If you decide to spray, then get a quart of lacquer thinner which should last a long time and get the basic railroad colors in lacquer. First of all is black for locomotives. This should not be too glossy or too dull, but a sort of semi-gloss. If you can't get that, get a jar or bottle of each and mix it to the desired sheen or gloss. Box car red is next and here again, if you are not able to obtain a realistic shade, you may mix your own to match the prototype color. For passenger cars, Pullman Green is the color unless you are modeling after Milwaukee or some other road which uses yellow or tuscan red. For streamliners, there is no limit it seems and they are of all colors of the rainbow. You will find it more economical to purchase the paints and thinner in large cans or bottles than small ones. Lacquer used in a spray gun should be thinned to the consistency of milk and sprayed on in successive layers, each layer being thin enough not to run.

For the brush painter, a slow drying oil or turpentine base paint is preferred to lacquer as the lacquer dries before it can be brushed out smoothly and shows overlaps in painting. The slow drying paints remain viscous until the model is entirely painted and tends to smooth itself and fill in the brush marks. In both spray painting and brush painting, it is advisable to use a filler or primer before applying the finish coats. The primer fills in the pores of the wood and when dry may be sanded to a smooth finish. Wood so treated may be brought to as fine a finish as metal. There are many different brands of good paints. In using them, do not apply too thickly so as to cover up detail, but rather use the paint thinly and apply several separate coats.

Other tools you may wish to acquire later on are soldering irons and hand drills. A good 100 or 150 watt electric iron will do most of your work. A heavy gas heated iron is nice for assembling heavy parts such as locomotive frames, etc. A small hand drill and various sizes of small drills from number 1 to 60 are nice to have and a drill press, of course, even better. The most useful sizes of drills will be those from about No. 40 to No. 60. In the interests of economy, once you determine the gauge to be modeled, you will soon find the size of the holes most frequently drilled such as those for attaching couplers and trucks and can limit the drills purchased to those sizes.

Several sizes of threaded bolts and screws are used in model railroading the most common of which are optical screws, 0-80, 2-56, 3-48 and 4-40. The taps for these are inexpensive, running about 35 cents apiece. In HO and OO gauges, the optical 0-80 and 2-56 screws will be used. The larger gauges will use mostly 2-56 and 3-48 screws. Your hobby shop dealer can give you the size clearance and tapping drills necessary for these, or a machinists chart may be obtained from any large hardware store which will give the whole ranges of taps, dies and drill sizes required.

I believe we have covered the most essential items and now, assuming that you have since last months article given some thought to your space and other things that might have a bearing on your choice of gauge, let us go into the matter of layout design. This will, for the present, be confined to a basic choice of track possibilities and the type of layout to be built. The simplest style and easiest to scenic is a shelf that goes around the sides of your garage, attic or basement. This also requires much less space and very good operation can be had with a siding here and there and possibly a small storage yard at one or both ends. This can be either a continuous loop or what is called a point to point system with terminals at either or both ends. Such a design also has the advantage of being easy to work on as all the track is readily accessible. The other type is a table design wherein the entire layout is built on bench work in a single area such as a space 10 by 20 feet and the track meanders all over and back and forth — it may even reverse itself. This also has some advantages such as giving one a birds eye view of the entire system. It is, however, a space hog and also is much harder to scenic properly due to the great area and also due to the fact that it may be viewed in its entirety. It is also harder to construct and maintain as you are forever crawling under the supports to get to the other side.

What I am getting at is this. If your space is very limited and you just can't see how you will be able to get anything into it larger than HO on a tabletop layout without having too sharp radius curves, it might be possible to increase the radii considerably by using a shelf type run around the walls and thus be able to use a larger gauge. Both types of layout have their advantages and disadvantages and it is not my purpose to pan one and boost the other. I merely wish to present the arguments both pro and con. Then after giving them due consideration you may choose the one that appeals to you and is better suited to the size and shape of the space that is available. The shelf type naturally places the operator on the inside of things and the table type puts him on the outside. That is, provided the operators position is not in the center of the layout.

Another thing to be considered at this time is the type road to be modeled. Are you going to pick out a prototype road such as the Sante Fe or New York Central or are you one of those rugged individualists who has decided to go "free-lance" and build whatever you darn please and then stick your own road name on it? One thing, if you go free lance, no one can criticize you for anything you do as you set up your own standards and build any type of equipment you desire. If you are going to be a purist and model one certain road, then I suggest you get some dope on that line's equipment, classes of engines, passenger cars, road rules, consists, right-of way standards, etc. Then when you make a purchase of any item, such as a locomotive kit, you will not be running a Union Pacific "800" at the head of a string of cars and calling it the Southern Pacific West Coast Limited. There are any number of choices and another thing to be considered is whether the layout is to run first class passenger trains or just freight. I would suggest that you start out with a small engine such as a Consolidation or Atlantic or even a six wheel switcher. A Consolidation has two small pilot wheels in front and eight drive wheels, four on a side and is designated as a 2-8-0. An Atlantic has four small pilot wheels in front, two on a side, and four big drivers and two medium sized wheels under the cab. It is called a 4-4-2. A Consolidation is strictly a freight engine used mostly on local or way freights. Quite often it is used for switching. An Atlantic is used on way freights and also is quite at home pulling a few short branch line passenger cars. It has big drivers and is capable of some speed although the tractive power is not great. The Consolidation has small drivers and is capable of great tractive effort, but not much speed. Another versatile engine is a Mogul. It has two pilot wheels and six fair sized drivers and is called a 2-6-0. It also may be used for

(*Continued on page* 41)

THE LAYOUT DOCTOR

Want to receive helpful suggestions on your model pike, criticisms that will add realism to your railroad. Send in a sketch of the layout to the Doctor, he will solve many of your problems and offer helpful suggestions on the correct location of tracks, structures and right-of-way equipment.

This month, G. E. Mattfeldt of Arlington, Virginia and George R. Christ of Bronx, New York have sent in sketches of their HO layouts for correction and comment.

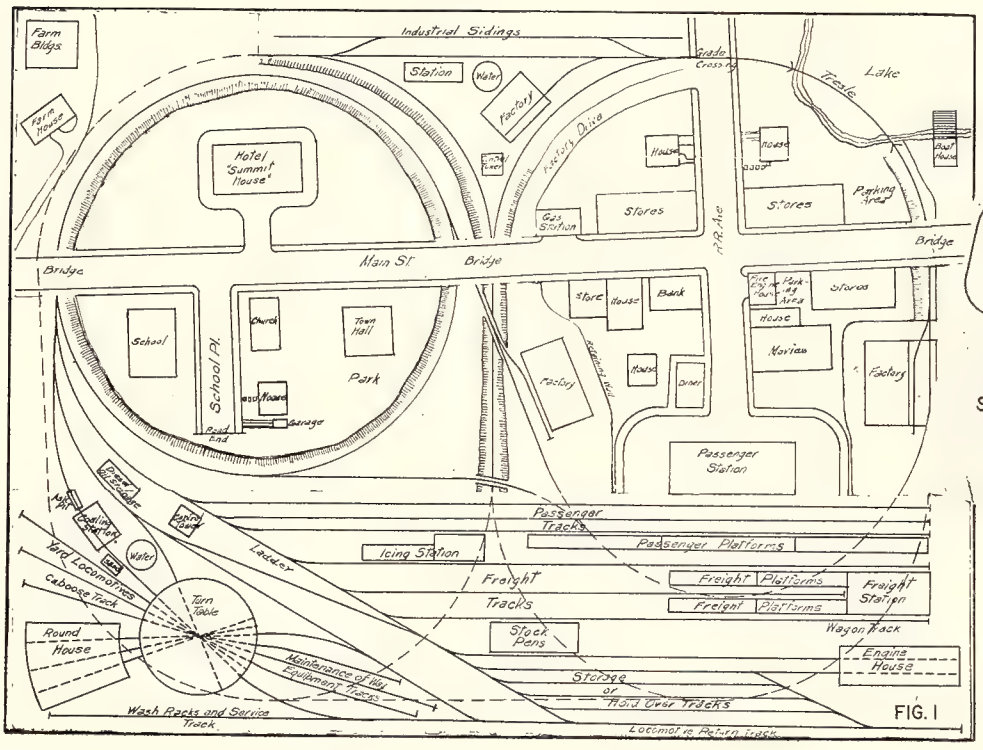
THE nine by twelve foot HO layout proposed by Mr. G. E. Mattfeldt of Arlington, Virginia, is shown in the diagram, figure 1. Lest this elaborate collection of tracks confuse you at first and even at second glance, I have shown in figure 2 the scheme of the thing. Basically, it is a large oval (at the lowest level), divided in half by a cut-off track which wyes into the oval at each end. This creates a very flexible arrangement for operation. A branch line leaves this large oval and climbs up to a reverse loop, off which is located a large passenger and freight terminal.

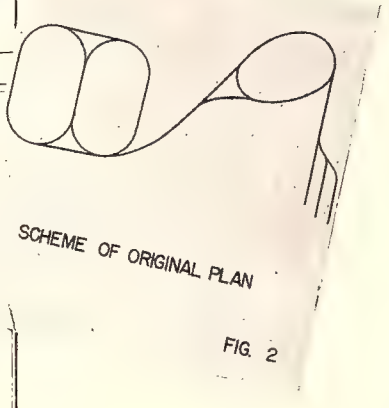
In his accompanying letter, Mr. Mattfeldt states that it is his intention to make the centers of his loops easily removable for access to the yards, etc. For operation on his proposed pike, he already has three passenger cars, a Walthers gas car, a ten car work train with Mantua Mogul, a two unit Varney diesel, a Varney dockside switcher, a Mantua Pacific, twenty five freight cars and three cabooses. All he needs is a layout.

At first glance, I was favorably impressed by the track layout of the high level yards and particularly of the engine terminal. The basic large oval with wyed in cut-off track is an old tin-plate design and still a good one. The layout as designed, with a few changes that would necessarily have to be made at the time of actual construction, would make a quite workable railroad, one on which you could have a lot of fun and operation. My first and even my second reaction was to mark this one with an A plus and award Mr. Mattfeldt a bachelor's degree in layout design.

But, if you go to a doctor for something you think might ail you and he proclaims you OK, you will try another doctor until you find something wrong with you. With that in mind I studied this layout and found one major and two minor faults, not to mention several picayune ones. The major fault is the symmetry of the basic oval at the lowest level which would lend the finished product a toy or tin-plate aura instead of the appearance of a scale model railroad and town. The first minor fault is the four switches hidden under the high level yard. While Mr. Mattfeldt states that there will be removable panels in front of the yard for access to these switches, there will be only six inches clearance to the wye switches and three inches to the loop switch — an almost impossible space in which to wield a soldering iron, pliers or much of anything else. The second minor fault is in the connection of the various passenger and yard tracks to the ladder track.

In this latter connection, some explanation is necessary. Mr. Mattfeldt in his letter specifies that all curves are going to be





The HO layout of G. E. Mattfeldt as submitted to the Doctor for revision.

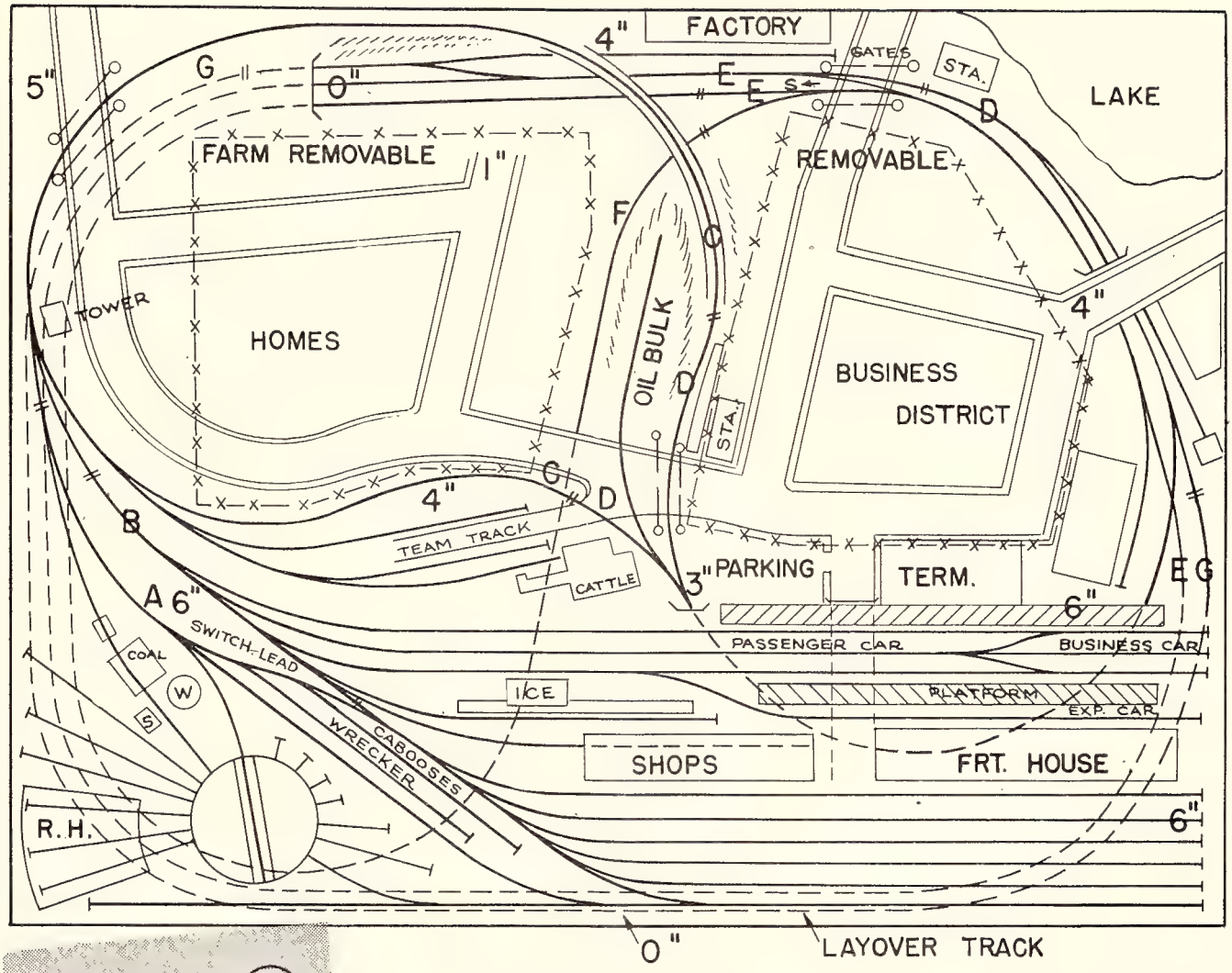


FIG. 3

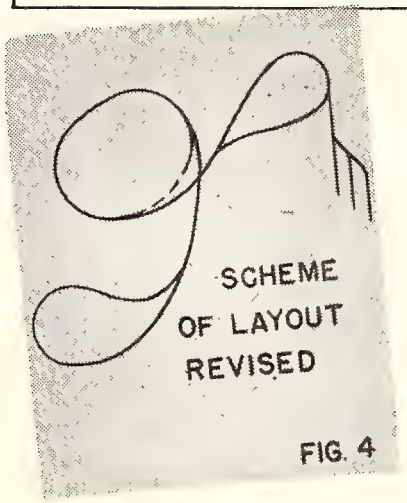


FIG. 4

Shown above in figure three is the corrected layout of G. E. Mattfeldt. This is a very elaborate pike with the centers of the loops easily removable. Figure four shows the general scheme of the revised HO layout.

at least 30" radius. If you continue that radius through your switches, you will get approximately a #5½ switch (a #6 switch is about 3 ft. radius in HO, a #5 is about 2 ft.). The *radius* of a switch is really the curvature of the part of the switch between the points and the frog—beyond the frog any curve can continue or it may run straight: and according to my calculations, the frog angle of a #5½ switch is 2 arctan 1/11 or about ten degrees. Now if the three parallel passenger tracks, for instance, are all to swing off the lead with thirty inch radius switches (#5½), then they cannot make an angle of much more than ten degrees with that lead and still be close to each other. And here they are drawn at an angle of about forty degrees. (Books on full scale trackwork have tables showing this for various numbered switches and various track centers in case you care to delve further.) If you will steal a look at the yards in my revised Mattfeldt layout, you will see what has to be done—bring pairs of tracks together just before they switch into the ladder track. The only alternative is to overlap the switches on the ladder—pretty tough work!

The double ended yard shown in the original layout is a very good thing for a model railroad since its avoids quite a few backing movements with cuts of cars. But you would have to have the same arrangement of switches at the back of the yard with the result that there would be only relatively short yard tracks left.

Among the picayune shortcomings of the layout are these. First, I do not believe that a railroad would build a trestle across just a corner of a lake as shown in the upper right corner: they would avoid it even if it meant filling up that corner of the lake. Second, the wye track back of the town hall is useless. Third, the switch to the factory in the center of the layout comes on a bridge where it would be hard to control. Fourth, having the fire house on a street corner as shown shows very poor planning on the part of the town fathers since they would collect more taxes if a commercial building were placed there.

The revised layout is shown in figure 3, with its general scheme in figure 4, basically a single track line with a revenue loop at each end, a terminal appended to one loop and a cut-off track to permit continuous running away from the reverse loops.

I have kept the high level terminal relatively intact except for the changes in the

(*Text continued on page* 40)

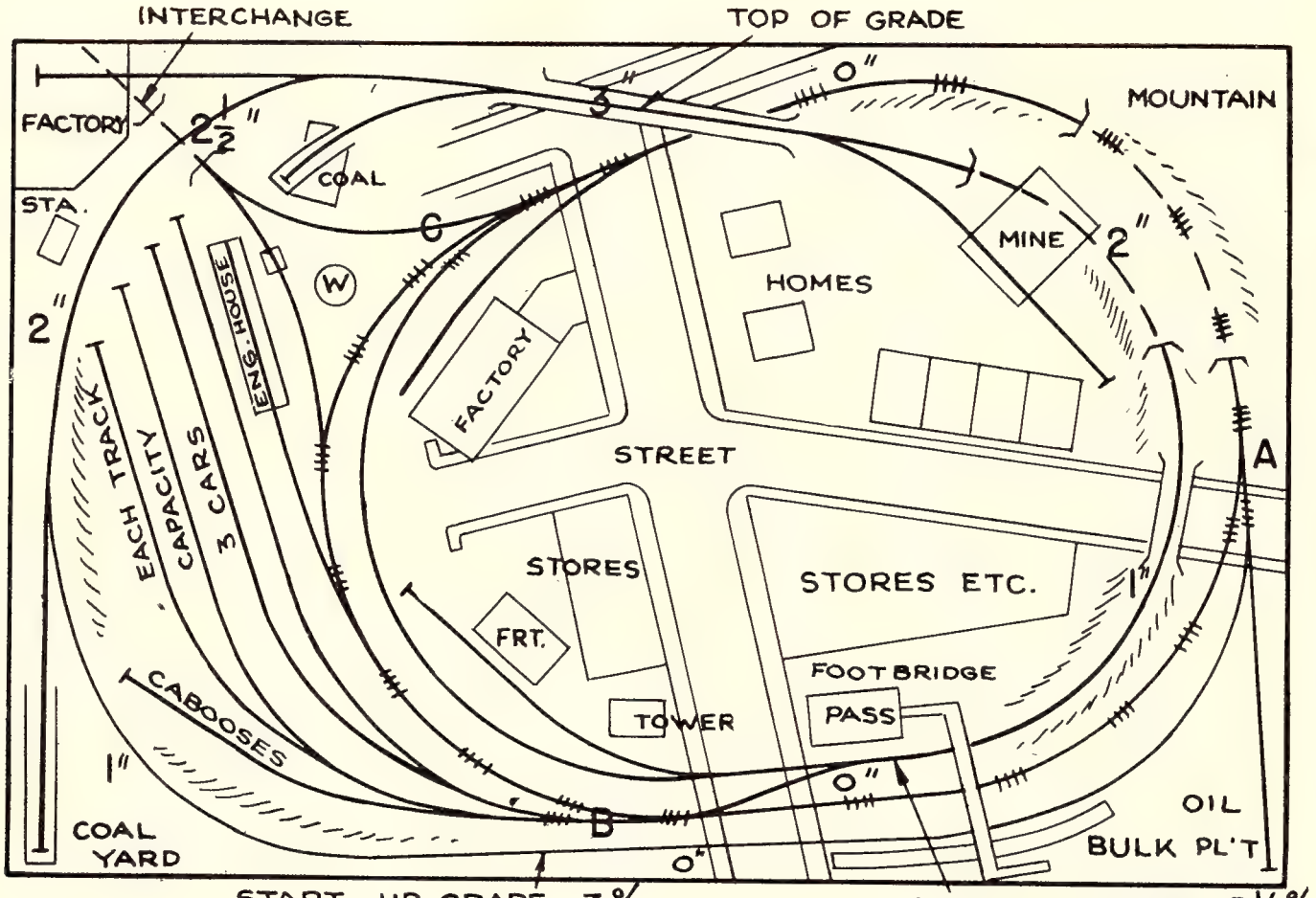


FIG. 6

HERE we have the layout of George R. Christ of Bronx, New York who has available a space of four by six feet for an HO gauge layout. Mr. Christ admitting he is a beginner encloses the rough sketch of what he wants shown in figure 5. This is the old inside-out-figure-eight that is a standby for all layout designers since it gives twice as long a run in a given area. However with steam train operation in mind, Mr. Christ has made a mistake common to many beginners in model railroading: he has not drawn his curves to scale. As drawn, for instance, the front curves of his sketch are six and nine inches, alright for a trolley or for specialized motive power, but otherwise undesirable.

Admittedly, Mr. Christ's drawing is a "sketch," but he as well as you should beware of a sketch of a layout unless curves are plotted somewhere near to scale. On a four foot wide panel the largest radius curve possible is twenty-two inches, but since this layout is the equivalent of double tracked, the maximum radius possible would be twenty inches. This layout could be built with twenty inch curves but the intertwining lobes of the eight would be very close together. Mr. Christ requested that I add yard tracks to the layout for him, so as to make a little more interesting operation and design possible, I have scrunched the maximum radius down to eighteen inches which will permit operation of consolidation type engines, with center drivers flange-less.

Now look at figure 6 the slightly revised and completed plan, using Mr. Christ's basic layout, the inside out figure eight.

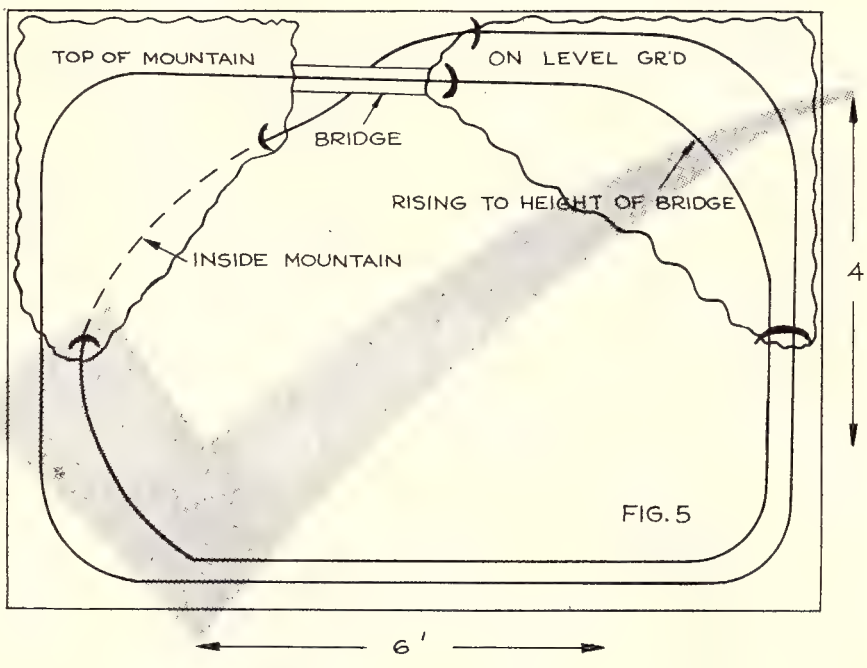


FIG. 5

The first trackage that any prospective builder of this layout should make is the oval indicated by the cross-hatched line, including three switches only marked A, B and C. This line is all at the level of the panel and should enable the builder to get something in operation quickly. Switch A can be extended around up grade, while switch C can be treated likewise in the opposite direction, eventually uniting. Switch B can be developed into the yard, which might at first be just one track. When the entire inside out figure eight has been completed, the various other switches and sidings can be added one by one as the

(*Continued on page* 47)

Diesel Passenger Locomotive

By WARREN B. CRATER

PART I

THIS is the first of a series on a streamlined train. The locomotive is a Baldwin 2000 H. P. double ender of the New Jersey Central. However, it is expected that readers will want to build diesels of other prototypes as well. Therefore in this series we will consider general design as well as scaled down dimensions, intending that some readers will use the model engineering ideas and apply to the scale dimensions of other types of road diesels.

In presenting the streamlined cars, several types of cars will be given with a different type of construction and color scheme for each. This will be intended to cover as many prototype roads and types of equipment as possible. The window and door spacing will be given in the accompanying drawings and the outward appearance and road colors may be used to suit the individual. Right now I am building something just a little different, a streamliner "Mixed Breed," and each car will be described as it is built.

It may be interesting to note that the first diesel-electric placed in railroad service was a 300 H. P. switcher, the Central of New Jersey's #1000. This switcher, in its twenty-third year, is still on the assignment for which it was built.

The #2000 is the first double-end single unit and is the first diesel to be pressed into suburban passenger service.

The accompanying drawings show the overall dimensions. The details of the machinery and construction will be shown in sketches as the work progresses. As the results obtained with the Lackawanna 2-8-0 were most gratifying, we have decided to present this job in the same manner.

With the small gears, etc. of the Boston Gear Works available in all the larger cities, catalog numbers will be given for these parts.

As with the steam prototypes, the construction begins with the main frame. First of all, study the sketches. The side members are ¼" x ¼" brass and the ends are cut from ¼" x 1½" brass. To make the ends accurately, chuck a piece of soft steel in the lathe and turn to ¼" diameter for about ⅞" and thread ¼" - 20. Lay out the assembly as shown in the sketch, drill the ¼" hole and mount on the jig securing with a ¼" nut and turn to 2½" in diameter to give the 1¼" radius. Cut out as indicated to receive the side members and to clear the bearing block on the trucks. The screw holes should be for #4 or #5 round head wood screws ⅝" long to hold the cab to the frame. Now use cab screws to hold these pieces on a perfectly flat board in their proper location. Also, secure side members of ¼" x ¼" brass with small nails. Be certain they are parallel and square before soldering, also be sure to allow a heavy fillet for added strength.

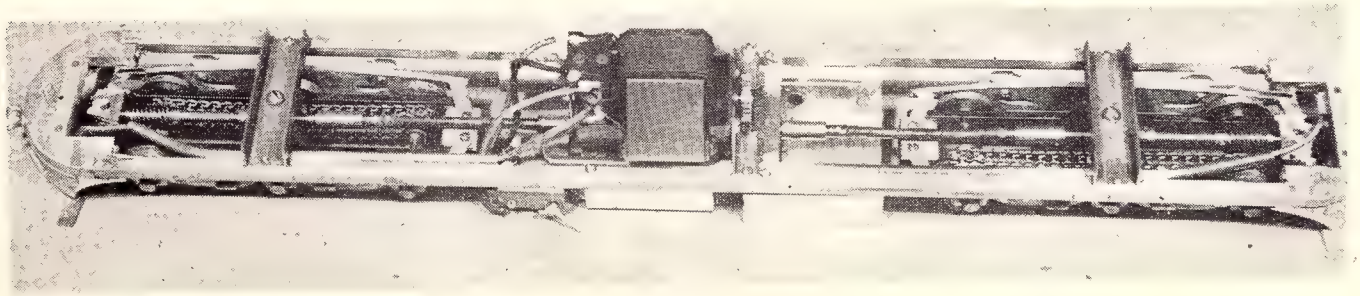
Transome for the trucks are cut from ⅛" x ½" brass 2¼" long. The center or king pin hole is drilled #27 to clear a #6-32 screw and the end holes are drilled #43 for #2-56 screws to be tapped in the side rails of the main frame on 12⅛" center lines. Transoms should then be soldered to the main frame. The ⅛" clearance from the ends of the transoms to the edge of frame is to permit the cab sides to go in place.

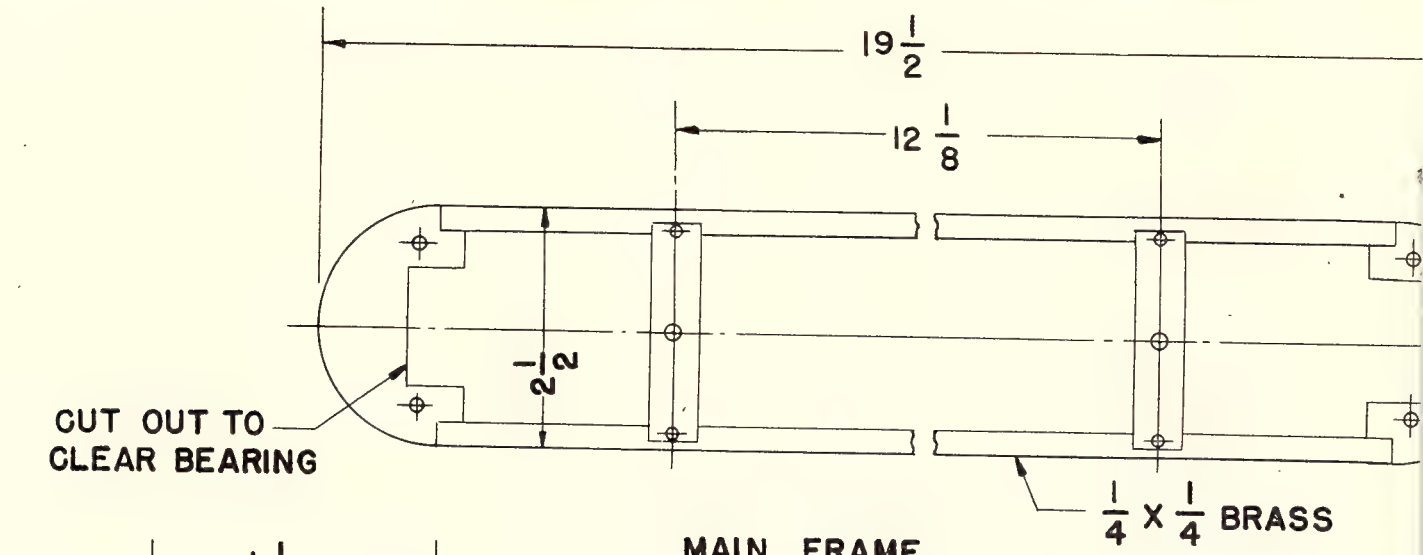
The solid buffer above the coupler is simulated with a piece of $\frac{3}{16}$" x ⅝" brass which is screwed to the bottom of the end piece of frame by #1-72 x ⅝" screws passed through the carrying iron, the ⅛" spacers (to allow for coupler shank), the buffer block and tapped into the frame. The coupler is swung on a #2-56 x ⅜" screw tapped into the block. (See sketch.)

The anti-climber can be made by chucking a short piece of 2¼" O. D. heavy walled brass tube in the lathe. Face off the end and then turn the grooves to represent the double channeled section with a special ground tool or a piece of old hack saw blade and part off. Saw out the four pieces that are needed. Drill #48 as shown on the sketch to clear a #1-72 screw. Clamp in place on the frame, then drill #53, tap #1-72 through the frame and screw in place.

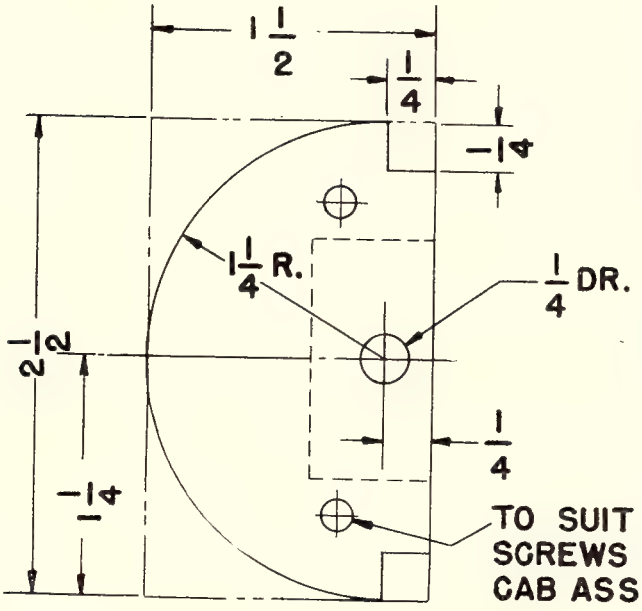
Make eight soldering lugs from $\frac{1}{32}$" x ⅛" brass, bend and drill as shown in the sketch. These attach to the bottom of anti-climber with the screws that hold them to the frame.

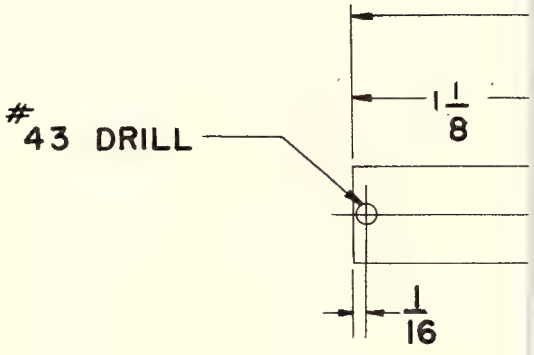
Lay out the pilot apron, as shown in the sketch, on tin plate or thin brass sheet. The cut outs at top are to clear the couplers, the anti-climber and at the bottom for contour. The #74 drill holes are for grab irons





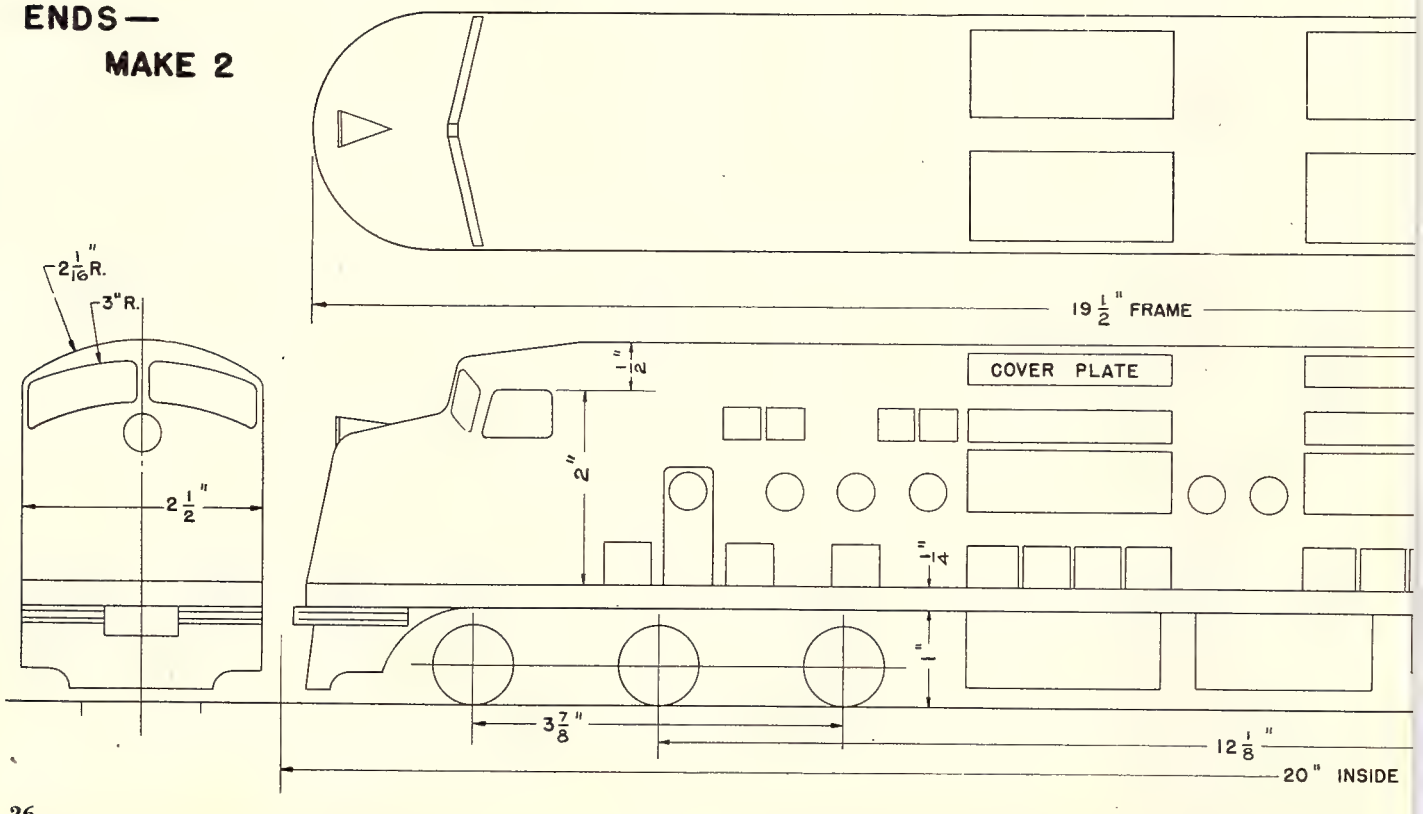
MAIN FRAME
HALF SIZE

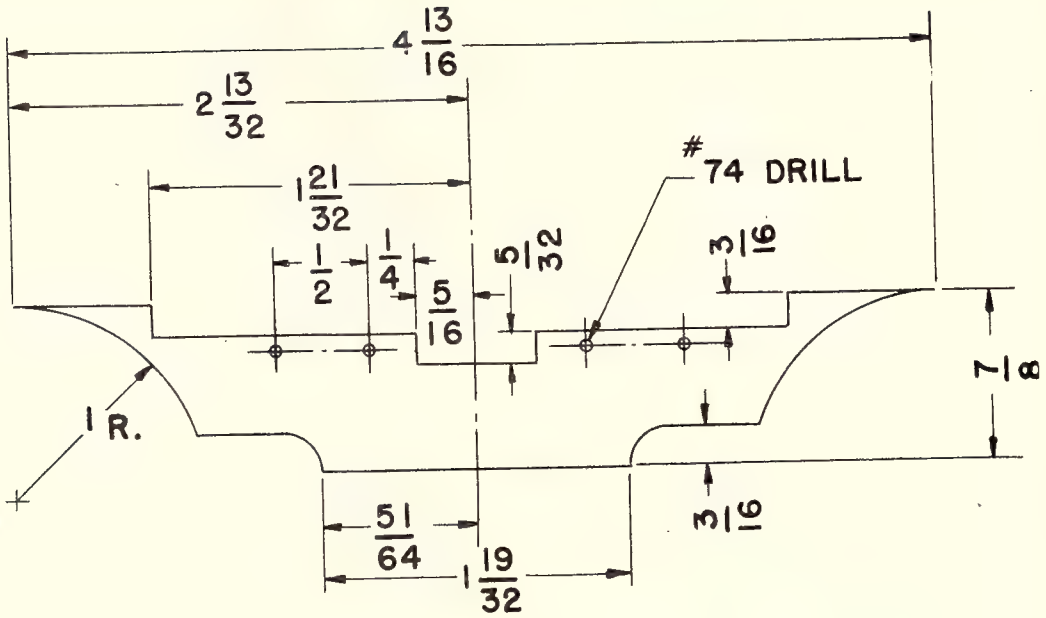




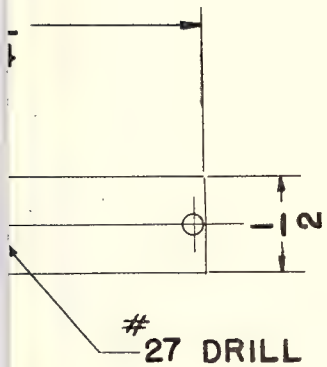
TRUCK T

ENDS—
MAKE 2

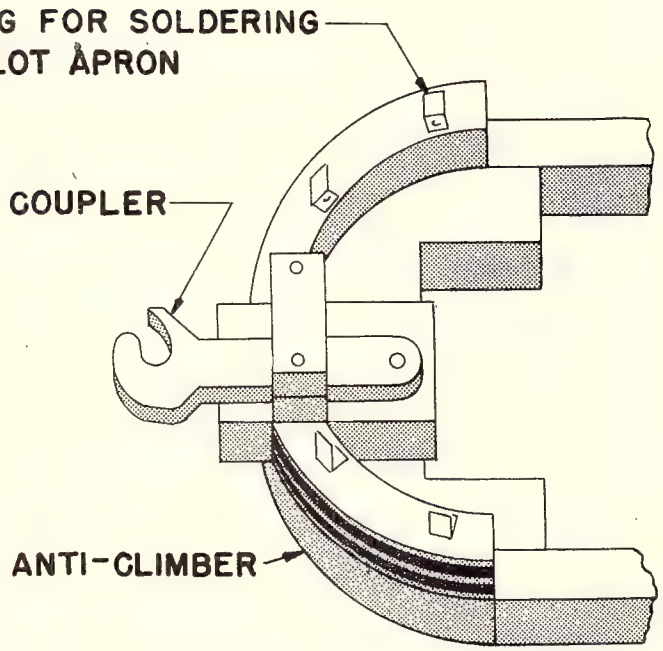




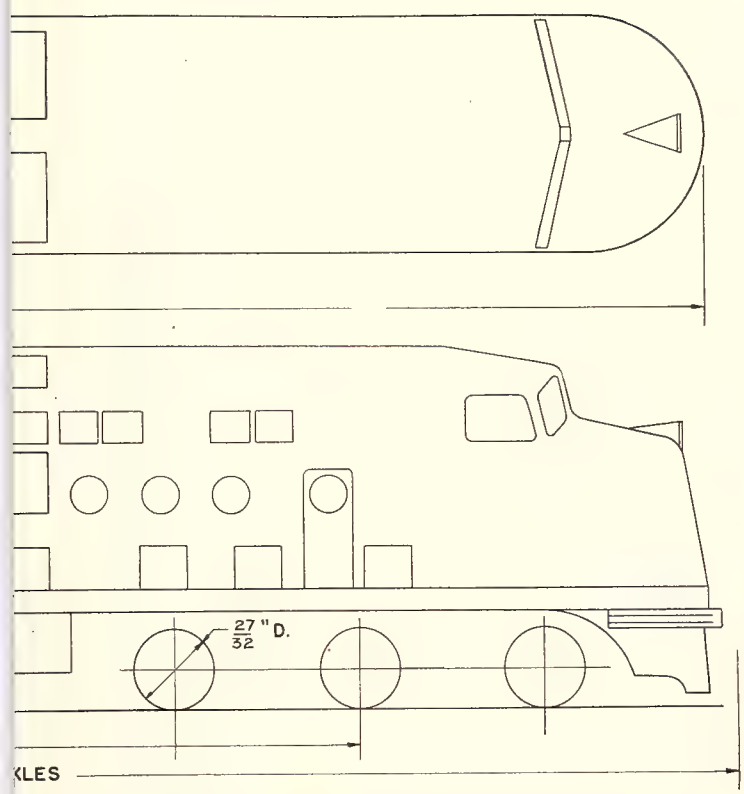
PILOT APRON – MAKE 2

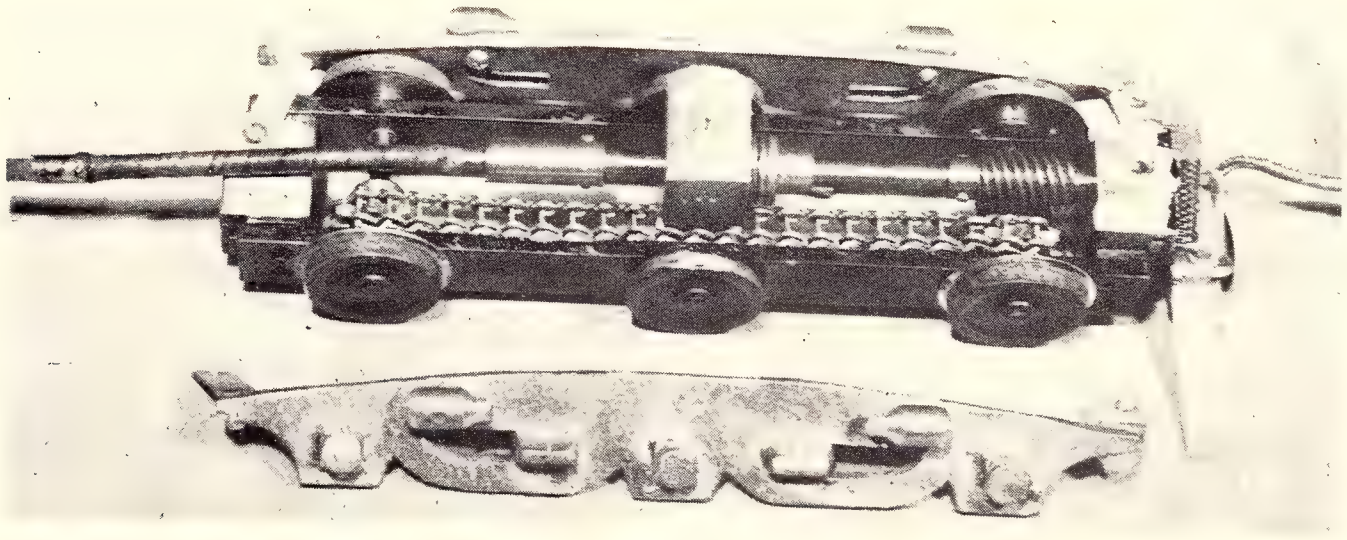


NSOMS – MAKE 2



BOTTOM VIEW – COUPLER & ANTI – CLIMBER



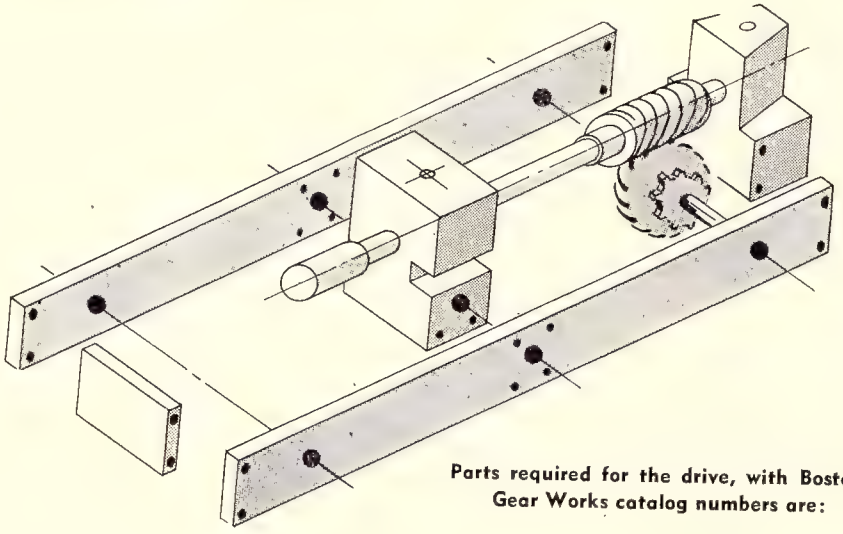


which are standard safety appliances. Bend these to shape, set in place hard against the bottom of anti-climber and solder to the lugs. The ends may be soldered to the main frame, being careful not to loosen the joints at that point in the frame.

Unless some model manufacturer comes out with this over-long truck, a choice must be made between making four side frames or making a pattern and having a foundry make the required four castings. Since the shrinkage in this small size is almost nil, I will describe the actual side frame and it may be used in either way. It should be noted that this type of truck is not used on all diesels and that some types are already available from model shops.

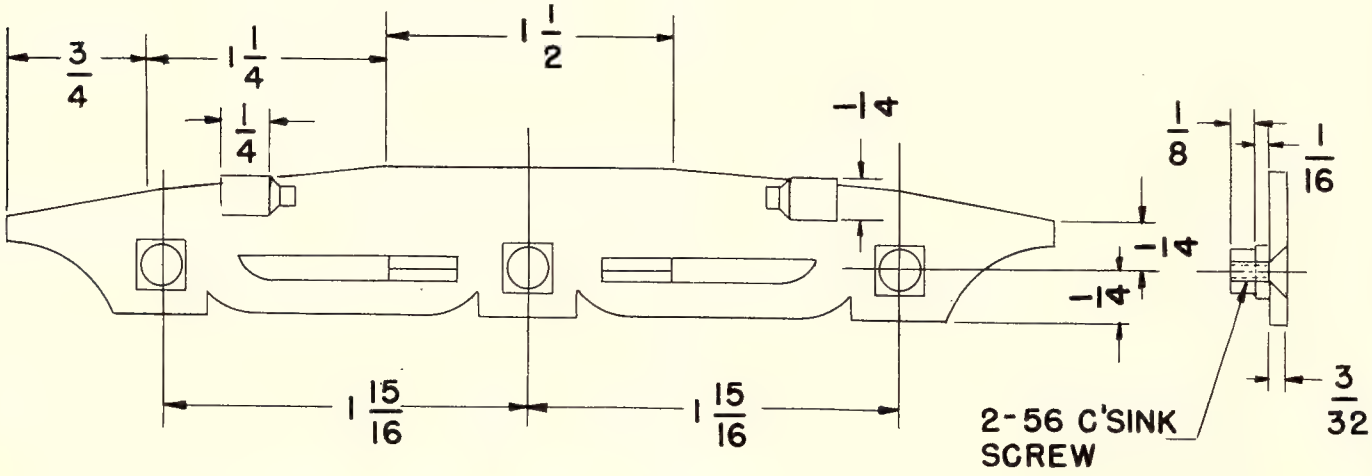
Take a piece of $\frac{3}{32}$" brass and lay out the side frame as the sketch indicates. This will give a somewhat tedious drilling and filing job. At center of the journal boxes, drill "43 and countersink at back for #2-56 machine screws. Turn the boxes from ¼" square brass, center, drill #48 and tap #2-56. File the ends of the eliptic springs from ¼" x ⅜" brass and solder in place. If using as a pattern, all edges should be tapered slightly to the front and finished smooth to permit drawing from the mould. Brake cylinders are also shown. They cannot be used on a pattern, but may be turned from ¼" round brass and attached to the

(*Continued on page* 42)

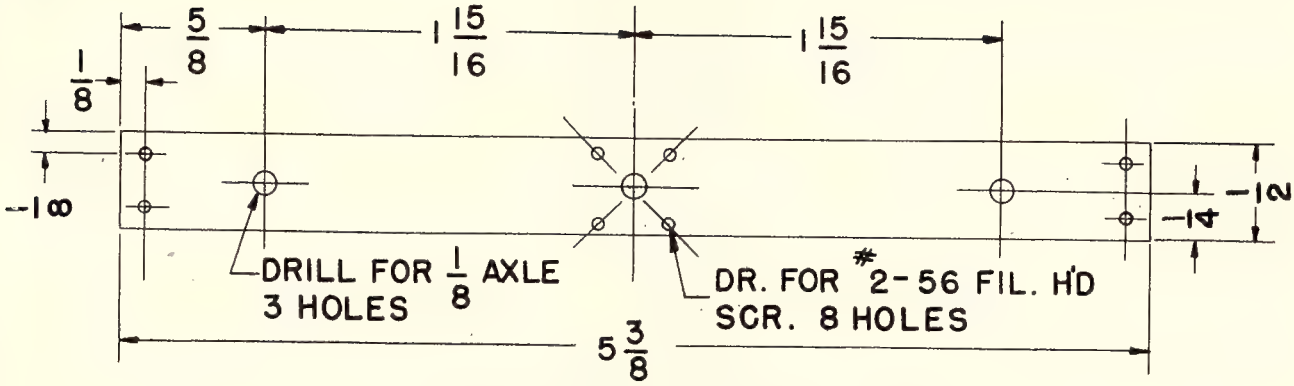


Parts required for the drive, with Boston Gear Works catalog numbers are:

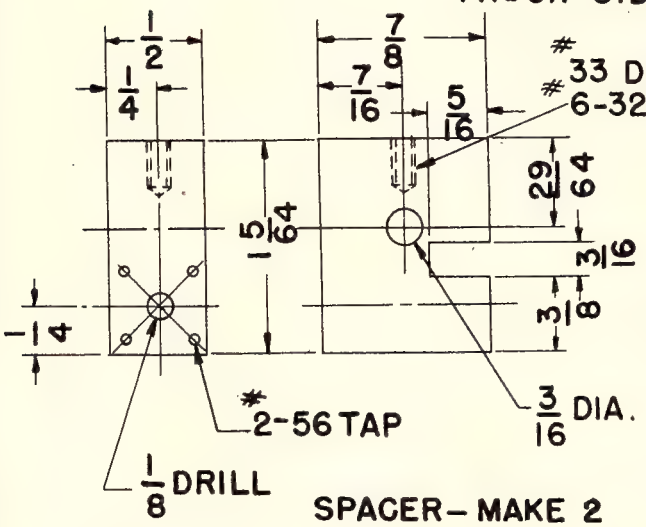
1 #G138 Spur Gear for motor shaft			$0.24
1 #G141 Spur Gear for jack shaft			0.35
2 #QSH Worm	@	$0.55	1.10
2 #Q1318 Worm Gear	@	0.50	1.00
2 ft. #1A Brass Ladder Chain	@	0.10	0.20
4 #CBA8 Sprockets	@	0.30	1.20
2 #A01 Thrust Bearing for worm shaft	@	0.50	1.00
Also Two steel balls ⅛" in diameter			



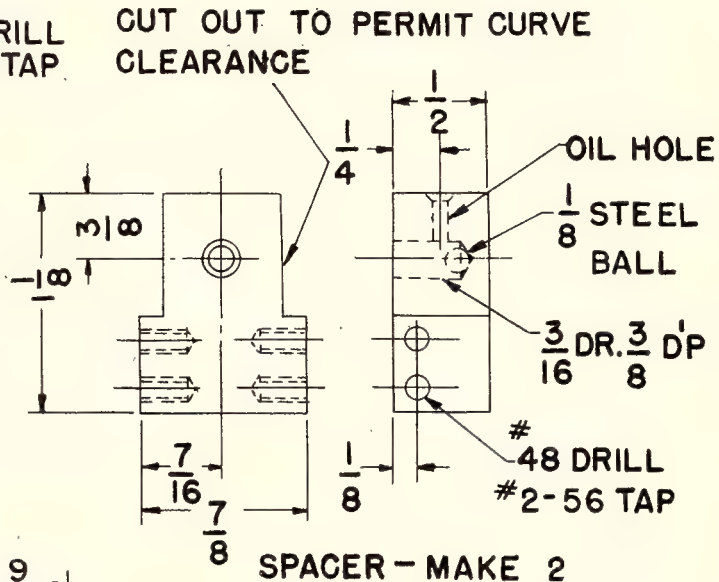
TRUCK SIDE FRAME — MAKE 2



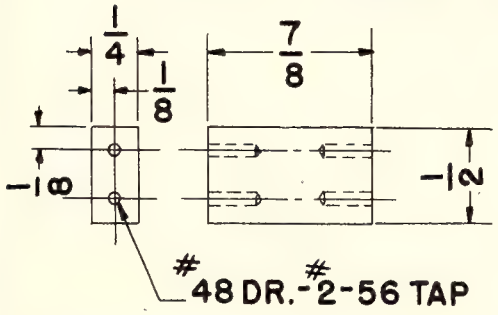
TRUCK SIDE FRAME — MAKE 4



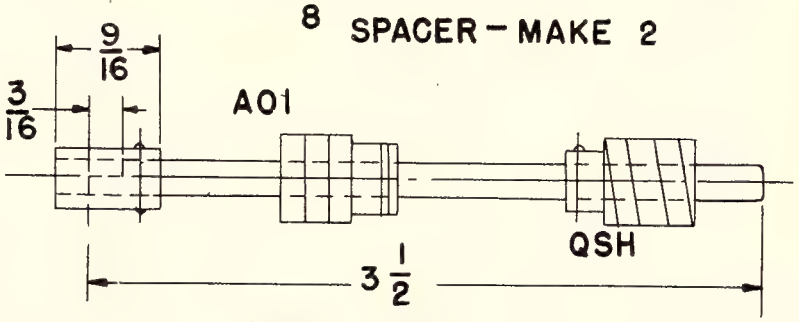
SPACER — MAKE 2



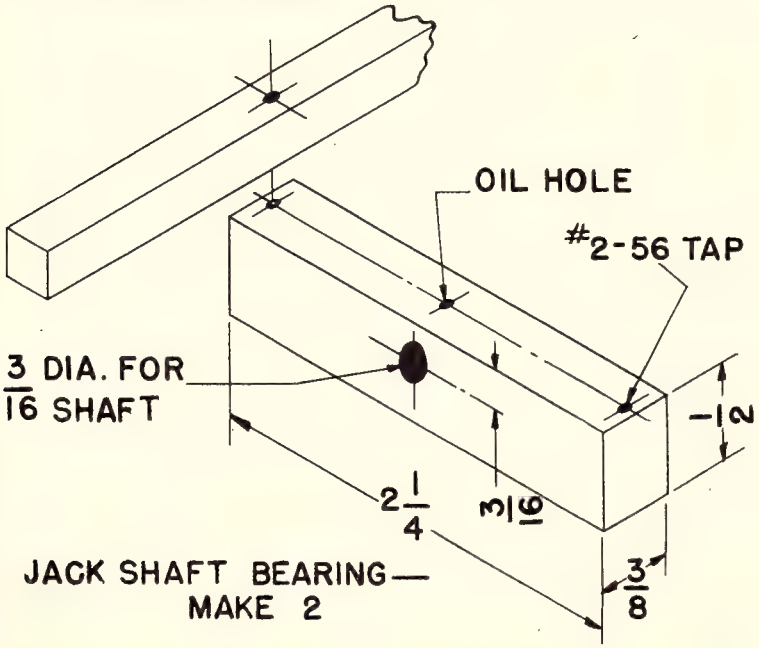
SPACER — MAKE 2



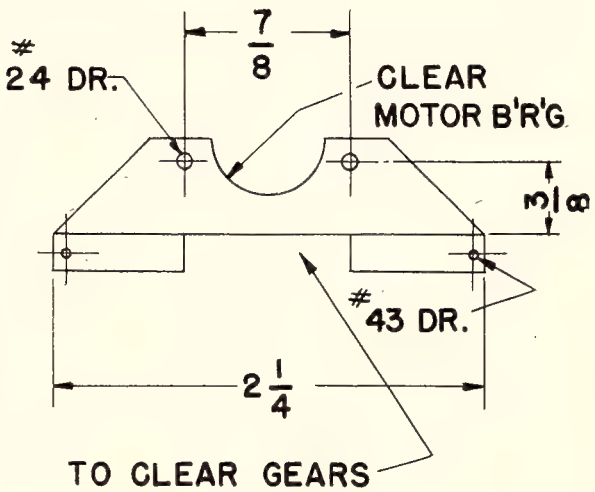
END SPACER — MAKE 2



WORM SHAFT — MAKE 2

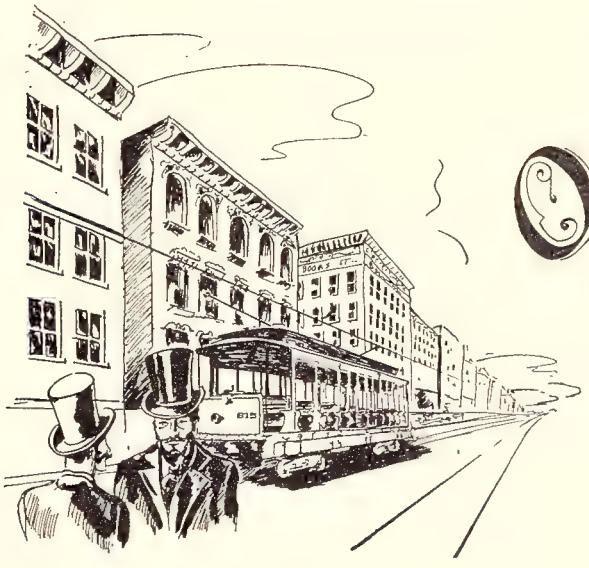


JACK SHAFT BEARING — MAKE 2



TO CLEAR GEARS

MOTOR BRACKET



ONCE UPON A RAIL

WHITE & GOLD DELUXE PASSENGER TROLLEY

By JAMES D. HALL

Here is another body design in the series of "old time" trolley equipment. Power trucks for this O gauge deluxe passenger trolley, "The Kubla Khan," appeared in the April issue.

THE Kubla Khan was a familiar shade in the great, gone days of street railroading. Especially when local elections threatened did the Kubla's ghost step down to invest the spirit of an otherwise fat, and unimaginative traction company president.

Say that the Herald has cooled toward its erstwhile great and good friend, the Center Street Railroad Company, and has joined with the opposition in decrying the hated "traction interests." The paving between tracks is in shameful disrepair and the Company has renegged on its promise to extend tracks to Oakwood Heights. Worse still, the Third Street shuttle line is still dobbin-powered!

"Five years have passed," shrills the Herald, "since the Center Street Company promised modern, electric equipment to replace the Third Street horse cars. Alas! Charley and Joe — Tom and Bess are *still* straining at the tugs down Third Street!" Reform candidates loudly proclaim the gang in the City Hall "hirelings of the Street Car Trust," and there is talk going 'round that the State Legislature, next term, will undoubtedly wish to inquire into the financial structure of the local utility.

There's no way to accomplish the lapsed promises of a decade. The boys at City Hall are laying low and the new crowd on Capitol Hill can't be greased — just yet! The Center Street Company's in a bad way and the president is a worn and haggard man. It's two months till election day and all the good ideas and glittery promises have been worked out. That's when the Kubla Khan would take over! There's a new gleam in the traction magnates eye and in a jiffy he's got St. Louis by long distance. The Big Man thinks it's HIS idea, but it's really the Kubla Khan's decree!

By sheerest happenstance, just two short weeks before the fateful election day, "The Center St. Railway proudly announces the acquisition of a DeLuxe Passenger Trolley." Full page Ads appease the Clarion and the Herald kills the lead story on page one to assure the electorate that "the new White & Gold Trolley is just a foretaste of things to come!"

Is there a citizen Brass enough to complain about a little bit of broken pavement here and there? Or one to protest the invigorating short-mile walk from Oakwood to the car line? Or a soul so dead who does not thrill at sight of the quaint Third street dinky? Or a socialist minded agitator to snivel about a wee bit of damp in the preferred stock? "Na!" says an enthralled and hoodwinked populace.

"Never underestimate the power of a white and gold trolley Throckmorton," whispers the departing shade, and the President knows that the Kubla Khan is right — right as a Dayton Recording Meter giving the lie to a light-fingered nickle grabber.

The author does not imply that ALL DeLuxe trolleys of the Golden Age were designed solely for the purpose of beguiling a restive public. Like the nickle that simply would stick to a bell rope, there was always the legitimate exception. Draw whatever parallels you will, Brother Traction Magnate, but the time will come when your line may need a DeLuxe job with which to win friends and influence people. So, here's the how: For a super gold-leaf job we're going to make sides, ends and dash boards of soft-drawn 27 ga. brass. We'll overlay the polished surface with white lacquer and afterward scribe through for our filigree gold work.

The car frame is built of wood with the longitudinals ¼" x ⅜" x 4" and the cross members ¼" x ⅜" x 1½". The front and rear platforms are made of 20 ga. metal bolted to the car frame as shown in fig. 4 to provide a slim platform line and a sturdy mount for the interchangeable motor used in this series.

Car sides are 2¾" x 4$\frac{1}{16}$" (over-all, allowing for curvatures and bends) and the dashes are ¾" x 2¼". The window cutouts are ½" x ⅞" allowing $\frac{1}{16}$" between window frames for the "gold-leafed" window stiles. Cut to approximate dimensions with a jeweler's saw and true up with a motor grinder and a fine toothed file. Shape the sides to conform to the template drawing in fig. 5.

The car ends are cut as shown in fig. 6, and you will notice that front and rear ends differ with regard to the position of the sliding doors; and that the front end sports a colored bulls-eye lamp in one corner, while the #2 end features a fare register in the opposite corner. The sliding door is suggested by showing only one edge of a highly varnished walnut door frame projecting into the aisle. (Fig. 2.)

The bulls-eye is a colored, glass bead snugly fitting into a hole drilled in the car end. The fare register, $\frac{5}{16}$" diameter by ⅛" thick registers "IN" and "Out" riders when your O ga. conductor is certain that he has a spotter among his fares, and works the loop of brown carpet thread hanging from one side of the "clock."

The bars across the end windows can be made from Woolworth jewelry, and the circular or oval bosses should feature the initials of your road. White lacquer over the brass and a careful scribing does it for you, neatly. Shop carefully for your junk jewelry. A fifty cent filigree bracelet of East Indian manufacture will give you all the fancy iron-work you'll need for hand railings, step brackets, window bars and dash board ornamentation. Avoid the rhinestone studded jewelry of home manufacture. It's too clumsy, and however resplendent, the White & Gold trolleys of the 80's and 90's did not go in for diamonds as big as basket-balls. However, while on the subject, some of our factory made imitation Navajo Indian jewelry does work out well with the ersatz tourquoise stones pried loose.

The end windows and the first four windows on each side of the trolley are fitted with black-walnut window frames which may be simulated by cementing walnut striped cover paper to the celluloid window inserts. The last three windows on each side of the trolley, believe it or not, are fitted with venetian blinds! Car #133, the only one of its class to ride out the San Francisco fire and earthquake of 1906, was

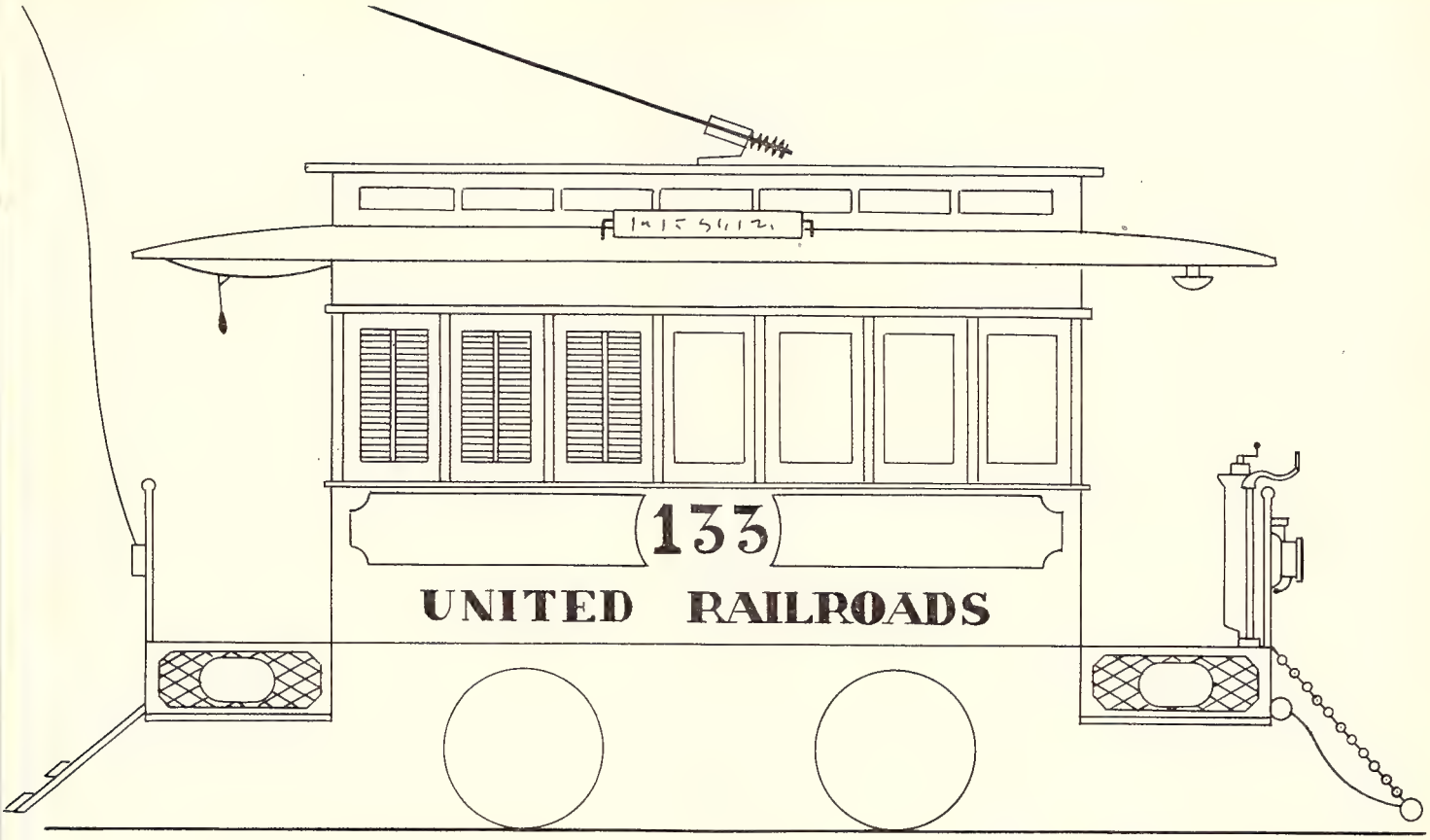


FIG. 1 FULL SIZE "O" GAUGE

VOTE
VOTE
VOTE

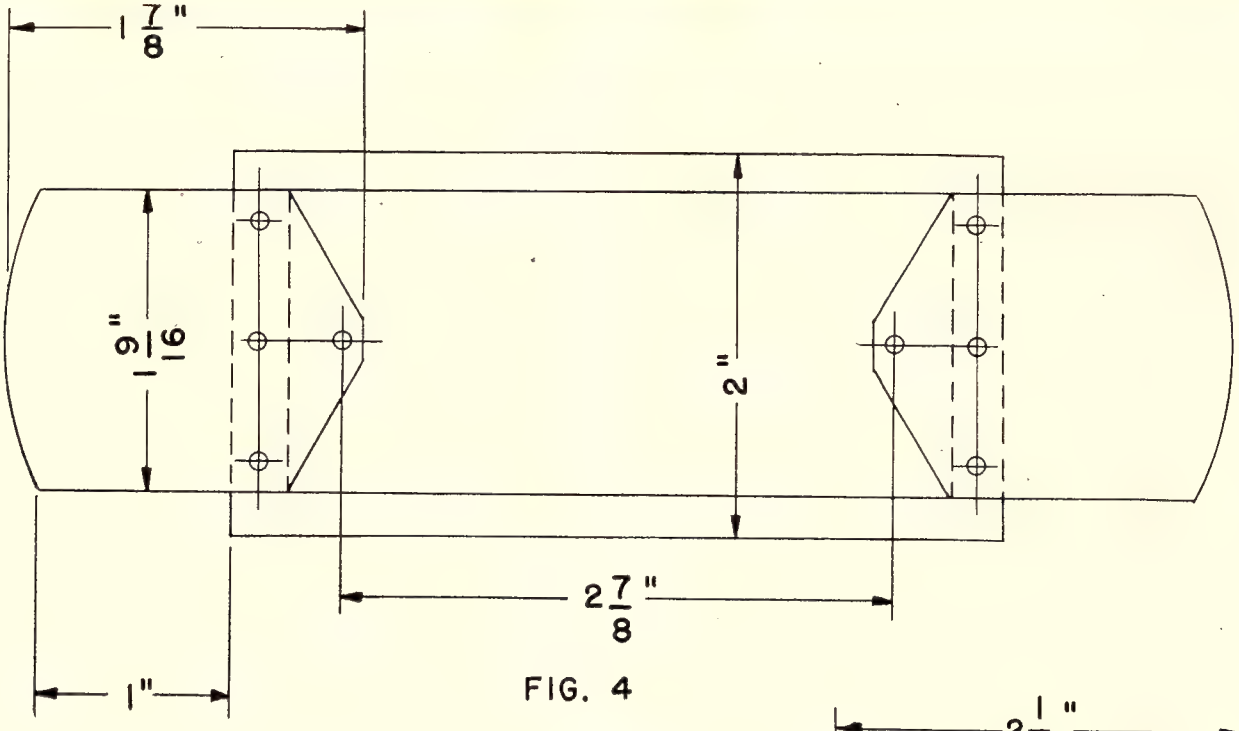
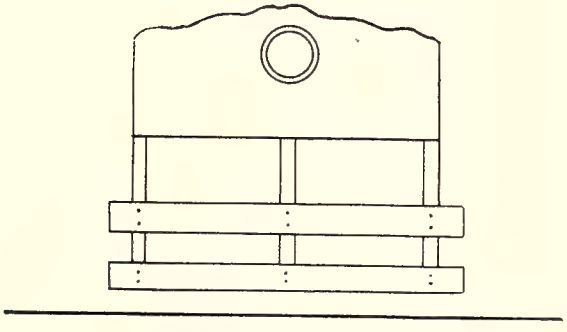
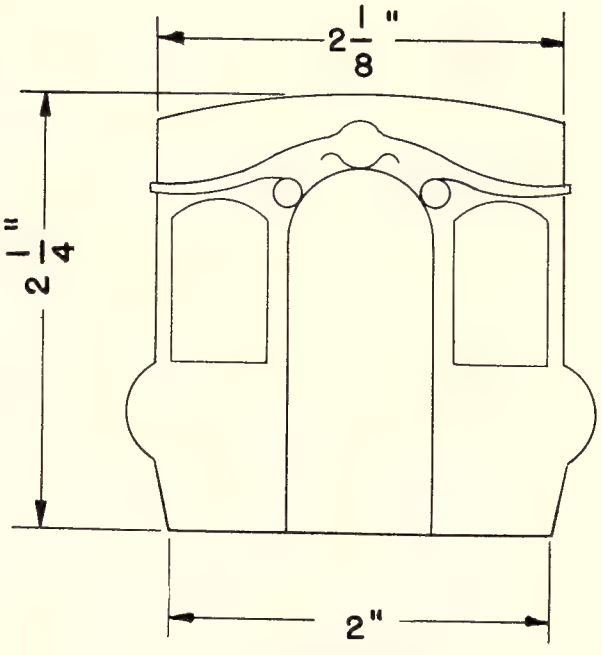


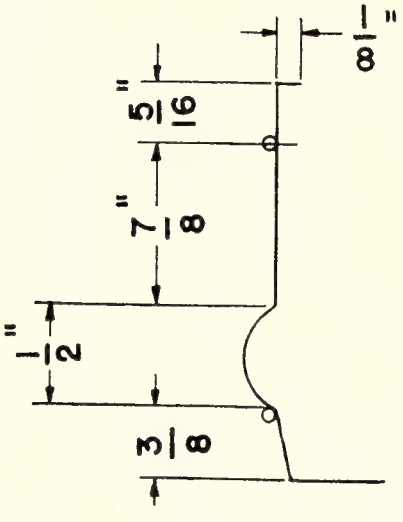
FIG. 4



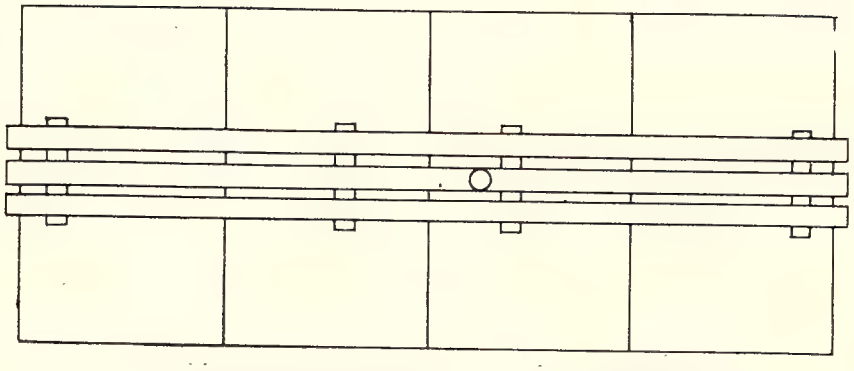
REAR FIG. 3



CAR END
FIG. 6



VERT. TEMPLATE
FIG. 5



CLERESTORY ROOF & CAT WALK

FIG. 8

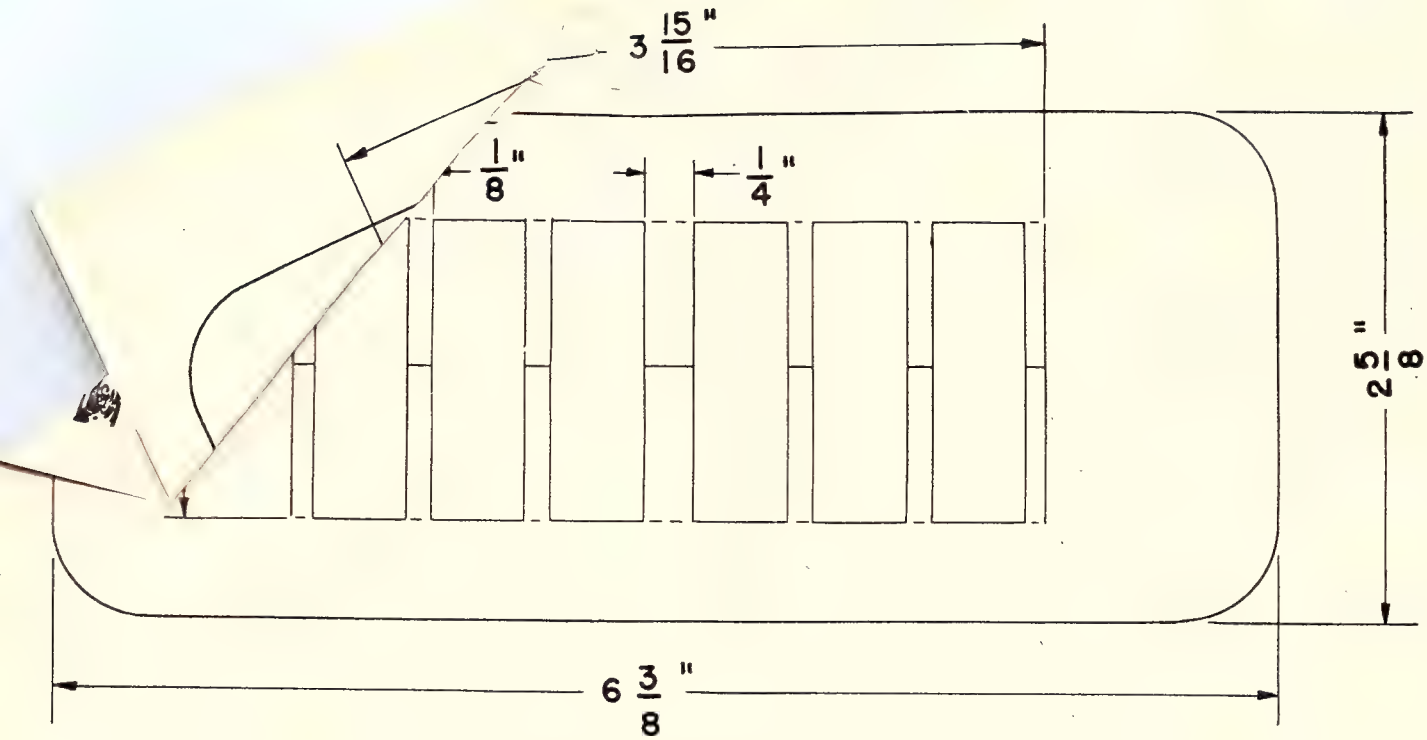


FIG. 7 ROOF

photographed by this writer in 1940, and was handsomely fitted out with venitians! They are also shown in old trolley pics of street car lines in Portland, Ore., New Orleans and Boston.

Venitian blinds with center dividing strip, are already made up in O gauge waiting for your artful snips in the new sun-excluding window screens now becoming popular. A salesman's sample will provide you with all the blinds you'll ever need.

The roof is cut from tin can stock 2⅝" x 6⅜" as shown in figure 7. Cut out only the shaded portions and bend the ⅛" tabs back to support the clesestory. The roof is shaped to fit the car ends and is slightly bent downward fore and aft for that raky "old-timer" effect. To hold the desired shape it is suggested that stiffeners of #14 wire be soldered to the underside of the roof over the platform areas. Roof dimensions are slightly oversize to allow material for curvature. Grind off any excess stock after assembling the car and bead the edge with a piece of #18 copper wire.

The clerestory roof proper, shown in fig. 8, is soldered to the supporting tabs and windows of celluloid are inserted. An excellent frosted glass effect can be obtained by backing the celluloid with "vitrophane" paper. This is the material commonly used on bathroom windows, and the fine lace curtain patterns are again plentiful at dime store counters for 15c a yard. Avoid the large colored patterns unless you plan to make your clesestory windows of alternate solid colors.

Front and rear glass destination panels are cut from heavy weight celluloid or lumarith, and are backed with colored cellophane. Decal transfer letters are slipped onto the cellophane before laminating to the celluloid.

The destination boards on the sides of the car are made from balsa ¼" x ¼" x 1" and are lettered with $\frac{1}{16}$" gold letters on a bright red or green background. Support the sign boards at the ends on bent pins soldered into the roof, and turn the boards at a slight downward angle so that the signs may easily be read by pedestrians.

The clerestory roof is soldered on to supporting tabs after it is bent to shape and 18 ga. wire stiffeners at $1\frac{1}{16}$" intervals are soldered transversely across the roof as shown in fig. 8. This detail adds a great deal to the character of your trolley, breaking the smooth toy-like line across the top. The cat walk is of balsa and the trolley of conventional design.

The remainder of the DeLuxe Trolley project is largely a matter of clean soldering and the addition of carefully considered detail. The front fender is made from black leather belt plaiting $\frac{1}{16}$" wide supported top and bottom or $\frac{3}{32}$" (OD) brass tubing and hung on bright brass model chain. The Brake handle can be made from a stick pin with a small tear-drop at the end.

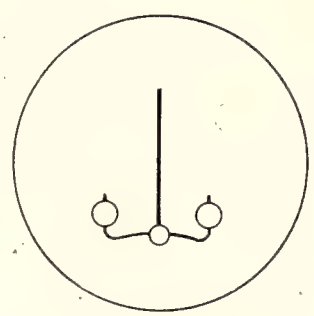
The headlight, fitted with a seed lamp and a cellophane lens, can be made from a brass grommet with the flange end soldered to the dashboard, $\frac{7}{16}$" diam. by $\frac{3}{16}$" deep is maximum. The trolley retriever is a knurled battery nut conveniently soldered to a screw in the #2 dash board.

If you wish to go whole hog for brass and detail, make the controller box from a piece of ¼" x $\frac{3}{16}$" x ⅞" brass and let it shine for all it's worth.

Dummy lamps for the interior of the car are made of 22 ga. wire and frosted. white, glass beads ⅛" to $\frac{3}{16}$" diam. A strip of car cards ⅜ x 4" will show if you want to take on that much work. One of the writer's first trolley jobs still begets him a great deal of satisfaction for having added this painstaking bit of colorful detail. Longitudinal seats finished in genuine red plush will do a lot toward hiding the motor, and with luck you might work in a motor that will permit a false floor in your DeLuxe trolley model.

Paint work is as follows: Body: White with gold trim (scribe with a dental tool taking pains not to dig *into* the brass). Doors and windows: Black walnut. Roof: Tuscan red with strips and cat-walk. Interiors: light green, walnut trim, plush seats and bright brass fittings. Platform floors: dark green. Handrails, step grids and "iron work" all are in bright brass finish.

Yes, you bet it's a lot of work! But the detail is worth every hour of the time put into it. Don't sell the Kubla Khan short . . . . You may need him someday, sabe?

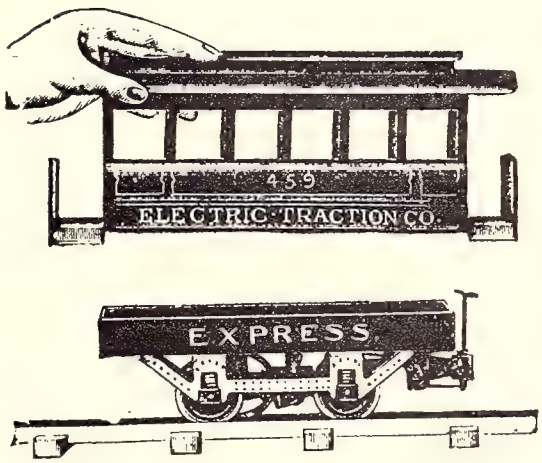


FULL SIZE DETAIL OF INTERIOR LIGHT FIXTURE FIG. 9

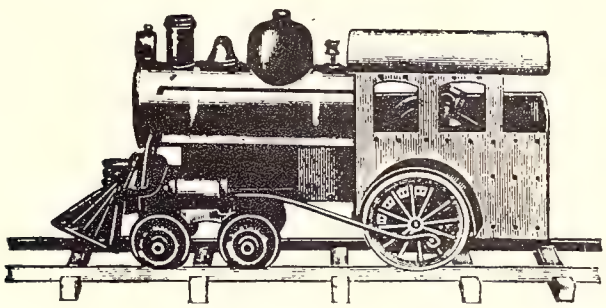
Next Month!
New York, New Haven & Hartford
Electric Motor Car

NEW NOTES ON HOWARD

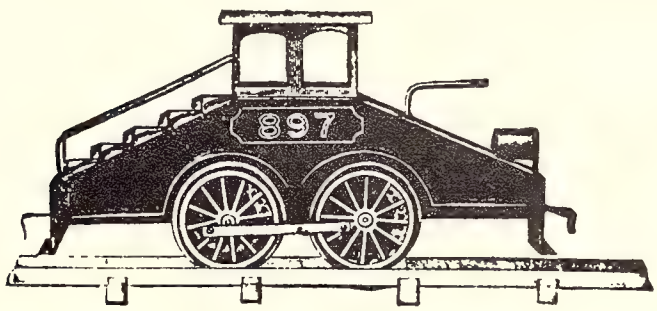
along the tinplate track with *Louis Hertz*



This was offered as "two complete cars at the price of one!" When you lifted the trolley body off, you had a motorized gondola car! It was one of Howard's most interesting models.



The Howard 4-2-0 No. 6 locomotive of the later, heavier style of construction. Built for two inch gauge, two-rail, it was 10" long, 4½" high and weighed 4 pounds boxed.



This is Howard's earlier version of the steeple cab electric type locomotive design which was so popular with early electric train manufacturers. It is shown equipped with Howard's intermediate coupler, an ordinary hook type.

THE history of the old Howard electric trains seems destined to be a subject that will continue to attract the attention of Tinplaters without any seeming abatement of interest. Some of the evident fascination of Howard trains unquestionably stems from the comparative elusiveness of facts concerning this line which stands, as it does, so near the very birth of electric trains in the United States. The continuing finds of surviving Howard products — in sufficient quantities to indicate that the line was by no means as transitory and little sold as some have believed, recollections of Howard owners and catalog readers in bygone days and such historical notes as those in this department in September, 1945, seemed only to serve to whet the appetite for "more" about Howard.

We hardly felt we had said the last word about Howard when we wrote the sketch in September 1945, although we did feel we had then about summed up almost all that was actually known about the company. We hoped that we could eventually shed more light on the subject. Several diverse factors — the location and examination of additional Howard locomotives and cars; further research in the records and the loan of a late Howard catalog by Burton Logan — would seem to indicate that the time has at last come to speak of Howard once more.

The catalog is perhaps the most important link in the chain, and oddly enough, it is the fact that it is a late Howard catalog rather than an early one that gives it its importance. We might hasten to note that the catalog is about 1909, which is "late" for a Howard issue. As noted on page 37 of the September 1945 Model Craftsman, the best evidence was that although Howard made a surprising variety of equipment (for example, they used three distinct types of couplers), they had only made trains for a few years, from about 1904 to 1907. This period hardly seemed sufficient to account for the variety of couplers, car trucks, or basic locomotive variations. According to the information supplied us then, it was believed that the train tools had been scrapped when the Panic of 1907 struck, and that while the company continued to sell out a considerable quantiy of stock, they made no more trains after that date.

As noted at that time, Howard's factory had been located in New York until that time. Subsequent factories were located in Newark, N. J. and Ampere, N. J. The full name of the firm was the Howard

Miniature Lamp Co. Inc., and the name had derived simply from the fact that the first factory was located on Howard Street in New York! It appeared that the company was originally formed to manufacture miniature bulbs and that the trains and other electric toys and novelties were a later side line. It also appeared that no trains had been made in New Jersey.

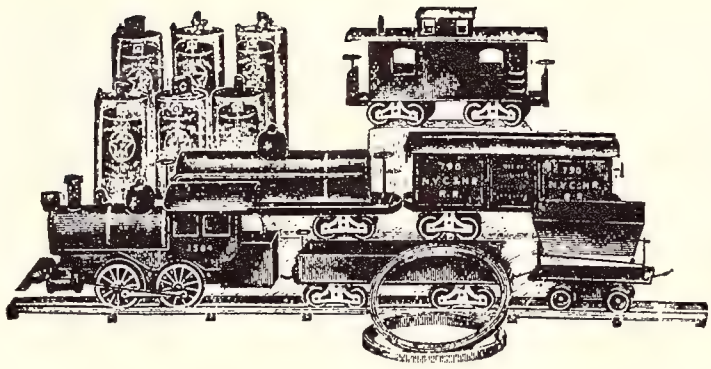
More recent research changes this picture somewhat. The company was originally named the Howard Electric Novelty Co. It is first listed, at 6 Howard Street, in the Trow Partnership and Corporation Directory of New York in the 1902-03 edition. Apparently their tenure on Howard Street was of very short duration, for the 1903-04 directory places them at 227 Canal Street. The name Howard Miniature Lamp Co. Inc. is first used in the 1906-07 edition, at which time the firms was at 58 Reade Street. The same listing is found in 1907; the company is not in the 1908 directory but reappears in the 1909 and 1910 issues at 234 Broadway, with the factory in Newark, N. J. In 1902 the officers were George Stein, president, and Charles F. Kabisch, secretary, they and Leopold Pollock being the directors. Later the principals were Harvey W. Harper, Herbert E. Plass, and Herbert C. Plass.

The catalog which Mr. Logan kindly permitted us to examine consists of 32 pages and cover. It bears the imprint on the cover of The New York Electrical Works, 234 Broadway, a firm closely associated with Howard and representing them before the public. The catalog cover says "Manufacturers of High Grade Electrical Goods" under their name and, indeed, there is no reference to Howard anywhere in the catalog except in the listing of "The Howard Watch Case Ammeter" and on the cut of that article. From the catalog alone, it might appear that a case might be made for assuming the company name had actually been changed to that of The New York Electrical Works, but the continued references to Howard in the contemporary New York directories leave this still a debateable point, and for the time being we believe it better and more correct to continue to classify and refer to all the equipment of this make as Howard.

About half the catalog is devoted to a complete listing of trains, equipment and parts. "Some Radical Features in our Railway Goods possessed by no others" — self centering brushes, elliptical truck bearings and link and pin couplers — are diagrammed on the introductory page. Mention is made of "our new four story factory in Newark, N. J." and the whole effect of the general train listings is that of current and aggressive manufacture rather than the mere dispersal of remaining stock. We could be mistaken on this point; the dies could have been scrapped in 1907 and all these listings merely represent old stock, but we believe it far more plausible than this elaborate catalog represents current production around 1909 of a very active tinplate line.

Further, a jobber's catalog, which can be identified only as prior to 1912 — possibly 1910 or 1911, lists a representative selection of Howard equipment, including new and improved models of two of the

(*Continued on page 41*)



An early Howard freight train, with the light weight 0-4-0 locomotive. Note the strip rail rolled up in front of the gondola car. This illustration also shows the Howard tank and four wheel dump cars.

TRAILERS.

No. 20

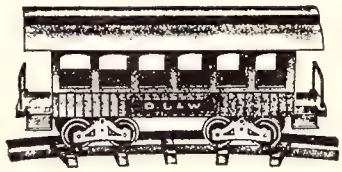
Flat Car, Price - - - - - 50c

By mail - - - - - - 70c

No. 21

Gondola, Price - - - - - - 60c

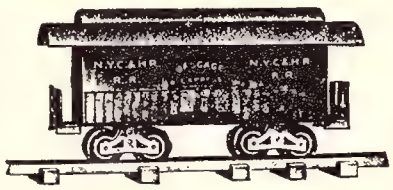
By mail - - - - - - 80c



No. 22

Passenger Coach, Price - - - $1.25

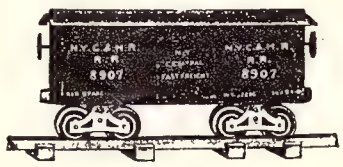
By mail - - - - - - $1.50



No. 23

Baggage Car, Price - - $1.25

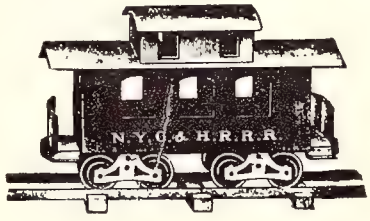
By mail - - - 1.50



No. 24

Box Car, Price - - - - $1.20

By mail - - - - - 1.45



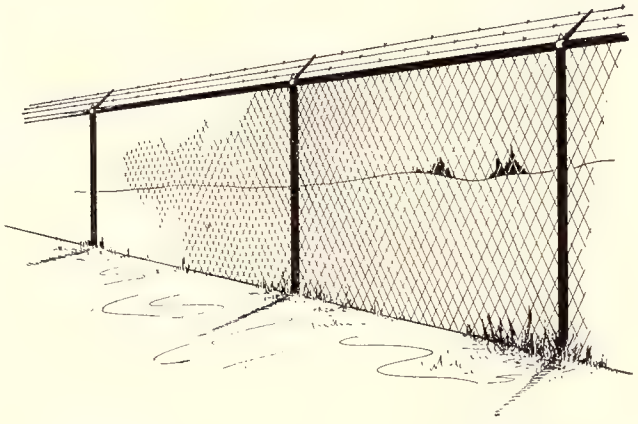
No. 25

Caboose, Price - - - - $1.20

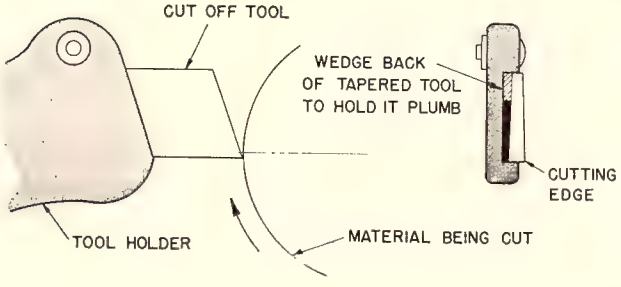
By mail - - - 1.45

A page from a Howard catalog of about 1909 showing some of their two inch gauge, two-rail rolling stock. The freight cars are their earliest models, which used a bow coupler similar to that employed by Carlisle & Finch.

Why Not!



WHY NOT throw a Cyclone type fence around that vulnerable defense plant on your layout? They are also ideal to keep the kids and non-revenue customers out of athletic events in your miniature rose bowl. The average fence is built in ten to twelve foot sections and is six feet high. It can be made by cutting diagonal pieces of fly screening and then pressing these pieces together lengthwise like a folding gate to get the correct diamond mesh. This screening is soldered to posts with bent ends. The "barbed" wire topping is soldered on to the top of the posts after the fence is in position on your layout. Necessary braces will be suggested by your nearest factory or school yard.



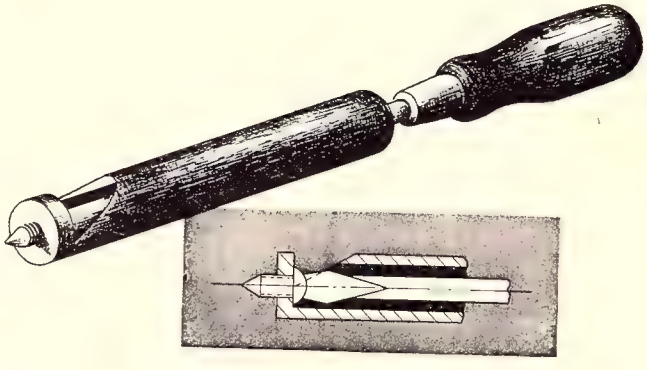
WHY NOT eliminate the chatter in your lathe cut off tools? Most amateur machinists have trouble using a cut off tool in a lathe. Tools chatter and dig especially if the lathe is not in good shape and the operator generally ends up by using a hack saw.

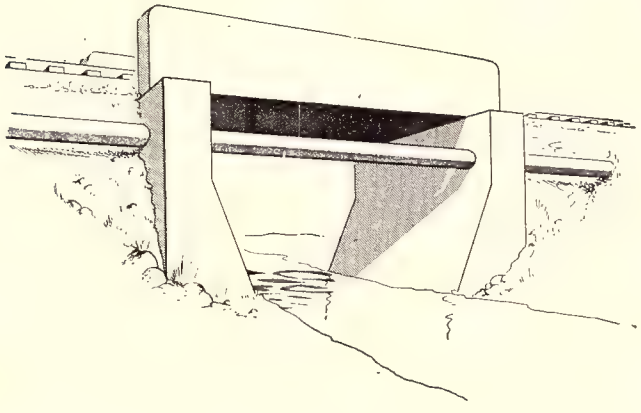
Reverse the cut off steel in the tool holder and wedge out on the thin edge of the blade so that the steel sets plumb in the tool holder as shown in the drawing. Run the lathe in the reverse direction and set the cutting edge of the tool steel $\frac{1}{32}$ of an inch below the center and at a direct right angle to the material being cut. Feed into brass and other soft metals fairly fast when cut is started. Pressure against the cutting edge of the blade from the bottom seems to act as a pry instead of a rocker as when pressure on blade is from the top. Cutting material in a lathe becomes a pleasure to th eamateur when this system is used.

WHY NOT hold and machine small, short screws in your lathe the easy way? Here is an ideal method for holding small screws so that they can be pointed, the holder described is for a size 6 machine screw.

Take $\frac{3}{8}$ inch round cold rolled stock that is two inches long and bore out the center with a $\frac{1}{4}$ inch drill to within $\frac{3}{32}$ of an inch of the bottom. With a #31 drill, make a hole in the bottom centering the drill in the quarter inch hole, and then threading for a 6/32 screw. Now with a $\frac{1}{4}$ inch bottoming drill, flatten the seat so that the screw head will have a flat surface to screw against.

Short screws can now be inserted in the threaded hole with a screw driver and tube mounted in the lathe to shape screw end as desired.





WHY NOT pipe oil to your refinery along your railroad right-of-way? Yes, that's right, many railroads have pipe lines following their tracks. Construction engineers of oil companies faced with the problem of laying miles of pipe from oil fields to refineries, struck on the solution the railroads have always used, the line of least resistance. Hills mean pumping stations and had to be avoided if possible to cut down on costs. It was better to go a few miles around than install expensive machinery and maintain it.

Streams could be forded without dredging by using the trestle the railroad already had built there. Today that is about the only place a pipe line can be seen. There and in a place where the railroad or nature had widened a cut or an enbankment had been washed down.

The accompanying sketch shows just how an interesting bit of detail can be added to your layout with very little extra work. Soda straws, painted silver or black, can be used to good advantage.

RAILROAD CLUB NEWS

(*Continued from page 5*)

following. In other words, when an engine enters the block, the signal at the end of the block shows the condition of the track in advance of that signal (or in the next block) will change from dark to the proper aspect: green if unoccupied, red if occupied and yellow if the second block is occupied. The other 6 blocks will represent the blocks approaching and interlocking and will be continuously lighted regardless of the condition of the tracks and display the proper indication.

The controls for the loop will be located so the public can operate them under the supervision of the attendant of the exhibit. Also a test panel with the layout or loops 12 blocks incorporated as a CTC board will be featured. The public will be given a very good show on a simple layout with a minimum of equipment.

The club also has a fan trip scheduled for 9 A.M., June 12, over the Delaware and Hudson Lines. This will be from Albany to Oneonta via Mechanicsville and Schenectady. Features of the day will include extensive observation of the Mechanicsville yard and the Schenectady Works of the American Locomotice Co.

Flying High

Mantua's now famous Traveling Exhibit, "The completely Automatic HO Model Railroad" will return from the Milwaukee model railroad show by AIR. This exhibit has proved very popular. So many shows have been clamoring to include the Mantua exhibit in their programs that it now must be *flown* from one show to the next. Those Mantua boys have a rough schedule to meet.

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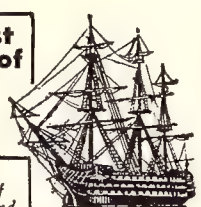

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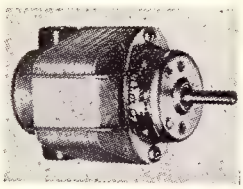

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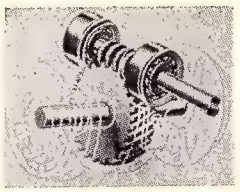

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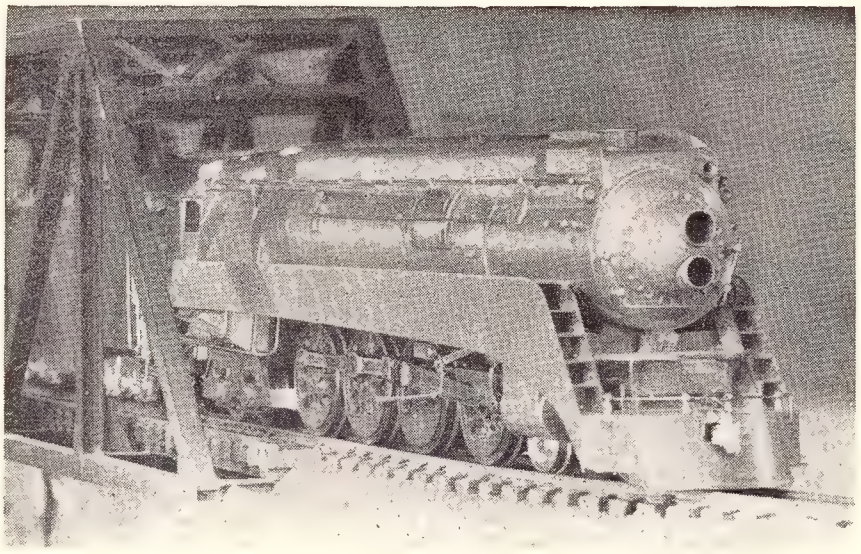


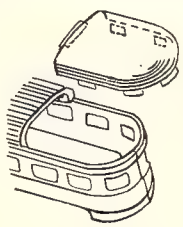
GS Class Southern Pacific

FOR the past year, the Model Railroad enthusiast has been able to secure almost all the materials that were needed to build any equipment that he might desire for his model pike. Also, during this period, many of the National Manufacturers of model railroad equipment have been tooling up for new models, but many of the rails have not waited for these kidts — they have forged ahead and built their first engine from scratch.

Such has been the case with Roy Cushing of Berkeley, California, a member of Roy's first effort in the model field was to purchase a kit from his local hobby dealer and construct a small engine. This did not satisfy his desires to become a full fledged model builder, so he took on the task of building in HO gauge a Southern Pacific GS Class engine. This type of power, a common sight on the Pacific Coast, is commonly called the "Daylight" engine and is of the 4-8-4 wheel arrangement. No manufacturer had seen fit to venture into this field so Roy had the task of starting from the bottom. The above photo will show how neat a job he has done.

The only purchased parts used on this engine were the Pittman "60" motor and the tender trucks. Other West Coast model builders had attempted to reproduce this engine before, but close inspection revealed that many of the parts were far out of scale, and the finished product lacked much to be desired of a real first class model. True enough, many hours of work were

OBSERVATION



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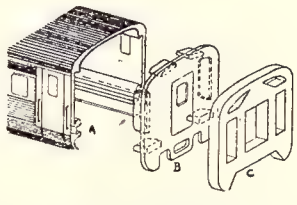

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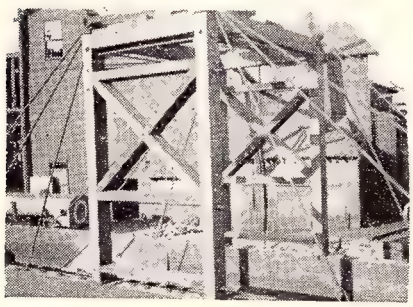
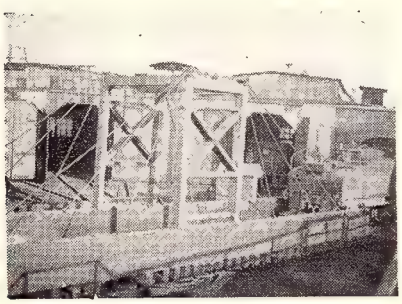
put into building the finished product, but the payoff came when the locomotive was put into operation. Here we find drivers, with stainless steel tires, fully sprung and also close inspection shows that the trailing truck is also fully spring. Close machine work has paid off in that the engine will start smoothly and work up to a final speed equal to that of its prototype. As for work, well, it will do just as big a job as the "real McCoy." GS, as all model builders know, indicates that this engine was intended for "general service" purposes and therefore you can see them carrying the famous Daylight passenger trains or handling a high speed freight that is being rushed to the market.

Models such as this are the inspiration to all builders. This model has inspired many others of the membership of the Eastbay Model Engineers Society to embark on projects of building both powers and cars from "scratch."



Gallows Type Frame Turntable

Two excellent shots of a Gallows Type frame turntable still being used regularly by the Pacific Coast Railroad. This turntable is similar to the "Gallows Type" described in the January issue of M. C. The Pacific Coast R. R. operates between Seattle, Renton, Maple Valley and Black Diamond, Washington, a distance of a little over forty miles. The P. C. is a coal hauling road only with little local freight, it runs but two trains per week and has recently received permission to abandon its line between Maple Valley and Black Diamond. . . . *J. M. Lagerquist.*



NOTICE

Due to sudden illness the Vacation Editor, Alfred Washburn, cannot be with us this month. He has obtained a wire recorder and will put it to use in the preparation of future articles. Look for him in the June isuse.

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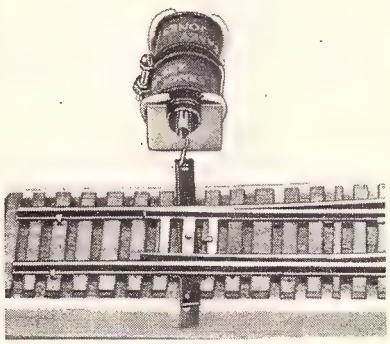

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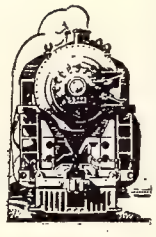

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LAYOUT DOCTOR

(*Continued from page* 23)

ladder explained above. I have added two cross-overs at the passenger terminal to permit the escape of the engine of an incoming train. These are not necessary of course if you pull the cars out with a switcher from the back end, but letting the engine escape permits the terminal tracks to be used for live storage of passenger trains with no backing and filling. There is also a spur for a business car. I have lowered the city from the high level to the intermediate level which allows a letter better scenic treatment of the center of the layout (on the original layout, note the cut two levels down—hard to scenic convincingly!). So I have the team tracks and cattle pen down at this street level as well as "parking" facilities. The shapes of the removable sections have been altered. The street arrangement is such that a dumbell shaped trolley line could be installed, minus overhead work (which would interfere with the removability of the sections).

The lowest level, which incidentally should be constructed first, shows the greatest change. All switches have been taken out from under the terminal and in place of the two wyes, there is only one reversing loop.

A train on the improved railroad would leave the high level terminal and proceed down grade, stopping at a suburban station near an oil bulk plant. After a short tunnel (under the terminal) it would swing into an outside oval and stop at another station. Just past the factory, the train takes to the center track of the three that start at that point, then goes around under the terminal and comes out at the station by the lake at which it just stopped. Now, however, it is on the inner track whence it proceeds straight ahead (over a spring switch) around a large reverse loop and then back over the whole circuit to the terminal again.

In practice there will be three choices besides a straight return to the terminal: (1) by utilization of the high speed crossover on the lower level, a train may be run continuously round and round on that level: (2) by using the reversing loop at the upper level, a train can go right down again without entering the terminal: (3) by using the outermost track *under* the terminal, a train may lay over and appear later.

There are several industrial sidings to justify the operation of a way freight which would pick-up and set out cars here and there. A through freight is also feasible, disappearing onto the layover track for the farthest end of its run. Besides the local passenger service, described above, a through passenger train could operate on the lower level oval, picking up and setting out passenger cars for the terminal and for the suppositious city which lies on the tunnel part of the lower reversing loop.

I have kept the prescribed thirty inch radius curves throughout except for chiselling it down two inches on that part of the upper reverse loop which leads to the team tracks, etc. In order to keep grades down to three percent (again except for that same stretch of track which can always be taken down grade) it was found necessary to elevate the right end of the lower level oval one inch. One important caution to the prospective builder of this layout: The level crossing at the extreme right is essential. Do not try to skimp by switching into the inner track, or the long run described will be nullified. A two-rail crossing at this angle will have to be built up, but once made correctly should give no trouble.

Seven different track sections, each with its own reverse switch and rheostat, are indicated, lettered A through G. Section A is the passenger terminal, section B the freight yard and engine terminal. C is the upper reverse loop and D the line leading to it. Section E is the continuous lower level oval available via the cross-over, while F is the low level reverse loop and G is the layover track. For purposes of economy in control equipment during the early days of construction, the layout could be gapped for the seven sections, but A and B and even C could be operated from one controller. D, E and G could run from another controller, but F would have to be separate.

WATCH MAKERS LATHE

(*Continued from page* 19)

possible with a drill, a jewel seat graver shaped as in fig. 9 can be made and used. Accuracy required in bushing a wheel requires such a cutter. This type of graver can be ground from an old graver, or filed from drill rod and later tempered by heating red hot and quenching in water or oil. The shape is quite critical, the reason for the sharper slope on the cutting point side being shown in fig. 10: if it wasn't sloped so much, it would snag in a small hole and the point would not reach the surface of the material to cut. Similarly the thickness of the end should not be more than 2/3 of its width. In use, this graver is held atop a cross-ways T-rest and pushed straight in slowly, cutting the hole a little larger each time. You push straight in, but the graver is not held parallel with the center line but at an angle as indicated in fig. 9 "top view".

Among the simple projects you can make on a watchmakers lathe, particularly in the smaller gauges are air-tanks, air-compressors, bells, headlights, whistles, domes, stacks, marker lights, handrail posts, flag-brackets and even wheels. Fig. 11 shows an interurban air-horn. The first step here after facing the end is to find Excenter and open it out very "shallowly". The shape of the trumpet is then turned, finishing up the wider part before going back to the narrow part, else the fragile neck might break when pressure is put near the end. After severing the horn from the rod, a nick can be filed near the bell as shown. By holding the neck in smooth pliers and pressing the bottom of the bell against a piece of wood, the characteristic shape of the old air-horn may be formed.

The tailstock of a jeweler's lathe may be locked in place on the bed, and its spindle pushed back and forth or locked

in any position. Except for one make of lathe, a chuck can be held in the tailstock only by the use of an adapter which fits the internal taper. A V-block can be attached to a taper to facilitate the drilling of holes across round stock (with the drill held in the headstock). A male center is standard equipment for a tailstock so that turning between centers (with the other end held in a chuck in the headstock) can be done.

A compound rest, with two or three slides, can be bought for around a hundred dollars which permits greater accuracy in turning, particularly where there is a lot of stock to remove. A wheel-cutter may be attached to a compound rest so that many types of gears can be cut. Another attachment available is a steady rest for supporting the ends or centers of long rods.

ALONG THE TINPLATE TRACK

(*Continued from page* 35)

locomotives! If there is not a general mix-up of cuts, with Howard continuing to use cuts of older models in their own catalog, this would seem to prove that manufacture was continued for several years after 1907 and that new models were actually brought out after that date!

A general listing of Howard motive power and catalog numbers will now not only prove useful to those interested in all the minor details of the subject, but will serve to illuminate some of the confusions and changes in the Howard line over the years, within a single locomotive number. The following Howard catalog numbers are now known, and probably comprise the full series:

No. 1—Small four wheel trolley, with removable body which would leave a motorized flat car.

No. 2—Large four wheel reversible trolley.

No. 3—Motorized gondola car.

No. 4—Combination of No. 2 with No. 3. When the trolley body is removed, the motorized gondola is revealed. This is pictured this month.

No. 5—O-4-O steeple cab reversible electric type. This was made in two models; the earlier one from the 1909 catalog, with hook couplers, is illustrated. The later model had pilots.

No. 6—"Switch Engine." The Howard catalog shows a 4-2-O, which is reproduced on these pages. The later jobber's catalog shows the O-4-O shown on page 15 of the September, 1945 issue. Both of these are tank locos.

No. 7—No record.

No. 8—4-4-O and tender. Reversible.

No. 9—No record.

No. 10—Deluxe 4-4-O and tender, with brass cab and trim, and working electric headlight. This was the first tinplate electric locomotive to have a working headlight.

In addition to the 4-2-O and O-4-O No. 6, there are two earlier Howard steam types, both of considerably lighter construction, and also in the 4-2-O and O-4-O tank type respectively. The 4-2-O was pictured on page 14 of the September, 1945 issue, while the O-4-O is shown this month in the freight set. Perhaps the original Howard numbering system called for the No. 6 as a 4-2-O and the No. 7 as an O-4-O, and these were the first two engines to bear these numbers. Perhaps the later, heavier 4-2-O and O-4-O were also Nos. 6 and 7 respectively, and the jobber's catalog erred in calling a No. 7 a No. 6. What the No. 9 loco was is also unknown. It hardly seems likely that it was assigned to one of the light weight models with wooden frames, which plainly are older than the heavier style locomotives. Perhaps No. 9 was skipped, in order to give the "important" number 10 to the deluxe model. Perhaps there is still an entirely different Howard locomotive yet to be discovered. The early 4-2-O is nonreversible. Perhaps Nos. 6 and 7 merely represented a reversing and a non-reversing version of the same locomotive, and later, when only reversing steam types were made, the No. 7 was dropped. No doubt this matter will eventually be cleared up with the location of surviving earlier Howard catalogs. In the meantime, we are justified in speculating on this point as we will.

In the Howard cars there was also two definite series, an early series in light metal, with wooden bolsters and stamped wheels, and a later, heavier series, with all-metal trucks and cast wheels. There was a four wheel dump car and a short eight wheel baggage car, coach, flat car, gondola car, box car, tank car and caboose as well, possibly, as a combination car. There was also a deluxe series of passenger cars for the 4-4-O locos, a baggage car, coach and an extra long vestibule Pullman Palace Car, as described in the September 1945 and January 1946 issues.

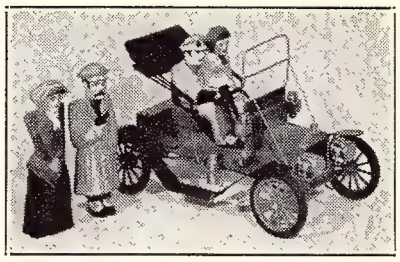
All Howard trains were, of course, 2" gauge. Both two-rail strip track and a two-rail sectional track with a rolled top rail were offered. The mystery of the seeming third rail shown in several of the early trolley cuts has never been cleared up. It is our hope that we may, in time, have new material for still another articles on Howard, in which we will perhaps be able to clear up this and other still clouded points concerning their history and products.

GETTING STARTED

(*Continued from page* 21)

freight or small local passenger trains. A later type freight engine is a Mikado, having two pilot wheels, eight drivers and two trailing truck wheels, making it a 2-8-2. An engine such as one of these may be used for most anything and then later on, if a modern passenger engine is acquired, the smaller, older style engine may be used on freights or in the yards.

It was my original intention to try and persuade you to buy one car kit to experiment with and in that way make sure you have selected the gauge you will want to stay with. I still think that is a very good thing to do. In selecting your first car kit, look over the various ones put out by different manufacturers. The hobby shop proprietor will not object to opening up a kit and explaining it to you. Examine



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it for quality of workmanship and exactness of detail, especially rivet detail, lettering and painting. Don't be too particular about the couplers unless you intend to use the dummy couplers furnished with the kit. The dummy couplers work all right in the larger gauges but not very well in the smaller ones as they bind and do not have the give and spring to compensate for switches and around curves. At least I have never seen any that were satisfactory in HO. I have always used Mantua Automatic couplers in that gauge. While not scale in appearance, they operate very well and I have pulled strings of thirty cars with no trouble.

One of the most important things to check are the trucks. Spin the wheels and see if they are true. Also, they should be in gauge. The detail in the truck casting is worth examining as well. One manufacturer put out trucks several years ago during the war that were atrocious. The wheels were of plastic with a molded axle and a steel pin was pushed through them to furnish a bearing. They would hardly turn and the ones that would turn were wobbly and had rough flanges. This was in HO gauge and I would defy anybody to try and run those cars on a track. It probably did more to discourage model railroading than any other one thing. This manufacturer did put out some nice passenger car kits. I had a string of them but the trucks under everyone of them were replaced with brass wheel trucks at added expense. Brass or metal wheel trucks are preferable to any others, but make certain the wheels are true running. I have seen some trucks in O gauge that had a plastic or tenite wheel that were satisfactory if cleaned up, that is, the flanges smoothed, etc. One of the best trucks I have seen in HO is that made by Micro-Motive. They have pin pointed axles and seem to coast forever. There are no doubt other good ones but Micro-Motive certainly sets a standard to shoot at. The brass wheels are insulated on one side for two rail operation.

Other considerations in a kit are ease of assembly, the fit of the parts and the amount of detail furnished. An ordinary forty foot box car is a good one to start on. Usually the sides will be printed, lettering and all. Assembly is a matter of putting together the wood body parts, adding roof walk and detail, grab irons, steps, ladders, couplers and trucks. I usually paint the roof, ends and underneath before adding the trucks, couplers and sides! The sides I cut to fit exactly, paint the edges all around and then cement the sides on carefully. This eliminates possibility of getting paint on the printed sides. Trucks are, of course, painted before mounting. They may be either dull black, box car red or a dusty grey. Sometimes the road specifications will call for a definite color. More as to couplers. Look them all over and decide which brand you want to use — then stick to that brand. Don't have three or four different types on your cars and expect them to work properly.

I'll leave you now with that car kit to assemble and next month we will go into other things such as rail, roadbed, spikes and the primary construction of some sort of benchwork to form a foundation for track work. Also we will discuss layout planning.

DIESEL PASSENGER LOCOMOTIVE

(*Continued from page* 28)

finished side frames with #2-56 screws from inside, tapped into cylinders and excess length cut off and filed smooth. These are dummies and will later be fastened to the actual trucks.

The trucks are made in the same manner as the frame and driving wheels for a model steam locomotive. For side members, use ⅛" x ½" brass. Layout and drill each pair, clamped and bolted together. The spacers are ⅞" wide to permit clearance for the chain. The width over assembled frame is 1⅛" and no spacing washers are needed on the axles.

All screws used in assembling the trucks are #2-56 x ¼" fillister head iron, set through side members and tapped into spacers, countersunk so that the heads are flush and do not foul wheels.

It is best to lay out two side members on stock, clamp to plain stock, drill and cut to size while they are clamped together, mark and mate accordingly when assembling. Drill the counter bores to take the screw heads.

The bearing blocks should be marked out and shaft holes drilled for a $\frac{3}{16}$" drill rod worm shaft. Line up the side members on a surface plate or drill press table with the ⅛" drill rod axles through the end axle holes. The Q1318 worm gear is stocked with a $\frac{3}{16}$" hole which will have to be bushed for the ⅛" axle. Slip this in place on the axle and then clip a piece of $\frac{3}{16}$" drill rod that is 3½" long through the bearings with the QSH worm in place. Mesh the worm and gear properly and clamp the assembly. Start centers of the screw holes in the bearing blocks. With a #43, drill through holes in the side members, then drill #48 to $\frac{5}{16}$" depth and tap #2-56. Assemble with the fillister head machine screws.

The wheels should be $\frac{7}{32}$" in diameter. If another size is used, the dimension 29/64" from the center of worm shaft to the top of bolster will have to be altered to give a space 1¼" from the rail to the top of bolster. About $\frac{1}{16}$" will have to be cut from the hub of the CBA8 sprocket which goes on the axle with the worm gear to allow clearance for the chain at the side member. Solder sprocket and worm gear to axle. Solder sprocket to the other axle. Press flanged wheels in place. Open center axle holes out to 9/64" or larger to permit slope, then put axle in place and press on the flangeless wheels. The slope in the center axle bearing is to put all weight on the driving wheels.

The 3½" lengths of $\frac{3}{16}$" drill rod will now become the worm shafts. Grind one end of each smooth and bevel the edge. File the other end to half the diameter for $\frac{3}{16}$". This is for the slip joint of flexible connection. Turn the sleeve for the slip joint and collar to follow the A01 thrust bearing from $\frac{5}{16}$" brass rod. Insert the ⅛" steel ball in the bearing block and set the shaft in with worm, collar and thrust bearing in their proper sequence. Locate properly and then drill and pin to the shaft. No. 18 x ½" escutcheon pins are very good for

this purpose. They require a #55 drilled hole. The slip joint sleeve may be pinned to the shaft in the same manner.

Flexible connections are not hard to make. The flexible shaft can be obtained from the local auto junk yard for a few cents in the form of an old speedometer cable. Cut the connector off one end and remove the shaft from the housing. As this is spring steel wire, it will be necessary to anneal it so that it can be cut. Do this with a torch or over a gas flame. This will draw the temper, but does not destroy it for our use. The usual size is about $\frac{5}{32}$" in diameter. Cut two pieces 2½" long and make the fittings of $\frac{3}{16}$" drill rod. Drill one end to take the end of flexible shaft to a depth of about ⅛", slip on the ends of shaft and then solder. File off to half of the diameter for a slip connection.

Attach trucks to the main frames, put flexible shaft slip fittings in sleeves on the worm shafts and cut the jack shaft from $\frac{3}{16}$" drill rod to length between shoulders on slip fittings on free ends of the flexible shafts. File off the ends for slip fittings and make sleeves as for the worm shafts. Make two bearing blocks from ⅜" x ½" brass as shown in the sketch. Assemble gear G141, bearing blocks and slip joint sleeves on the shaft. Pin the sleeves to the shaft. Allow about $\frac{1}{16}$" end play for one bearing between sleeve and gear. Solder the gear to shaft on the side away from the bearing. Locate on the side rails of main frame in proper position to flexible shafts and then secure with #2-56 machine screws. These may be soldered for additional rigidity.

The motor bracket shown in the sketch is for a K & D motor. If another motor is used, make the alterations to suit.

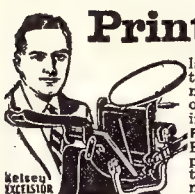
Press the gear #G138 on motor shaft to just clear the bearing. Bush if necessary and cut off excess shaft. Motor end frame is then tapped for #6-32 screws on ⅞" centers. The #24 drill holes shown are over size to permit the proper mesh of gears.

Remove the trucks from frame. Make brackets by bending strips of $\frac{3}{32}$" brass cut into strips about $\frac{3}{16}$" wide. Fasten to the end spacers of trucks to carry the dummy side frames so that they clear the wheels. Make sure the boxes are in line with the wheel centers. Solder side frames to the brackets.

Under body detail consists of water and fuel oil tanks and air reservoirs, one on each side. The tanks are rectangular and reservoirs cylindrical — see drawing. The tanks can be bent from sheet brass or tin plate and screwed to frame. The reservoir must be omitted from one side to make room for the reverse switch.

Collector shoes may be mounted at the ends of trucks on fibre blocks, screwed to bearing blocks.

The wiring should be carried through a brass tube where it passes the gears and bearings to prevent oil from getting on the insulation and destroying it.



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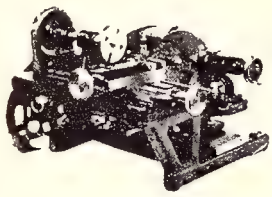

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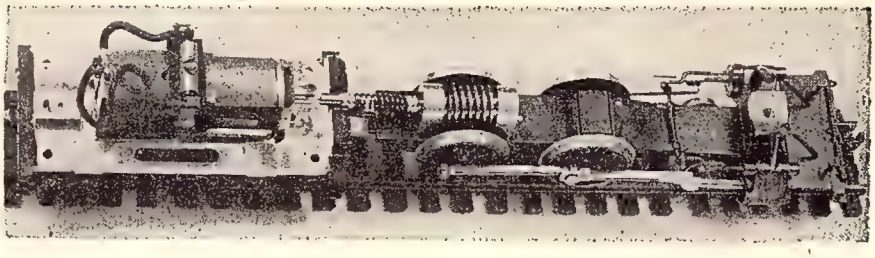

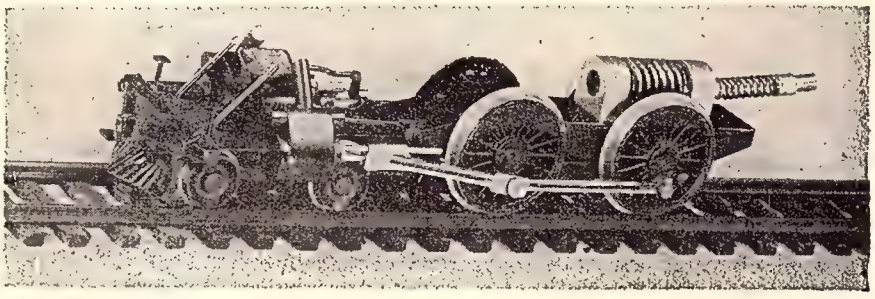

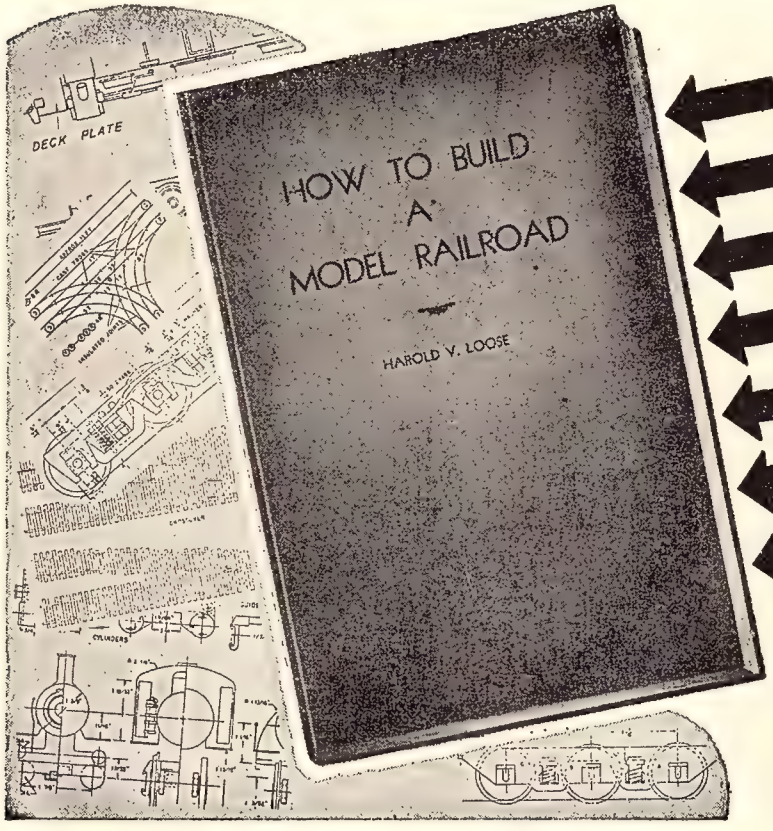

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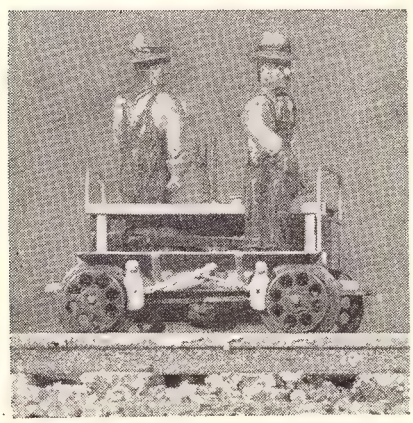
Nearly every active model rail enthusiast has said,(at one time or another, "What this railroad needs is a motor car for the section gang." At the Eastbay layout, it remained for Cliff to change the thoughts to action and produce one.

When interviewed for some of the construction details, Cliff said that the most difficult part of the entire job was getting the figures to look true-to-life. They were originally commercial figures, but in order to get the right seated positions, he had to amputate the arms and legs and rebuild them to suit the model. The scooter is powered by a 12 volt permag motor which he built himself. It's three pole and each pole has 400 turns of #40 wire. The motor drives one set of wheels by means of a train of spur gears. The wheel base is one inch. The figures were .painted by John Sweet, another member of the Eastbay Society who could give the fellow who writes verses on grains of rice a run for his money.



VERTICAL STEAM ENGINE

(*Text continued from page* 15)

last finish can be done with a piece of #200 grit emery cloth, using a reciprocating motion to give it a very smooth finish after the grooves have been cut. The .190 plus or minus .001 diameter counterbore must also be concentric with the outside diameter.

The piston rod (detail #6) can be made from $\frac{3}{16}$ diameter stock and polished to size with #200 grit emery cloth after the #5-40 threads have been cut. To make certain the piston does not loosen from the rod, the threads may be center punched after assembly. The $\frac{1}{16}$ hole should be drill-

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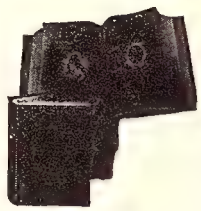

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O GAUGE

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OO GAUGE

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"Thunderwin", U Control (McElwee) ..... May '46
The "Atomic", U Control (Shulman) ..... June '46
"Pirate", Control Liner (McGovern) ..... Sept. '46
Your Engines (Class A & B Survey) ..... Aug. '46
Your Engines (Class C Survey) ..... Sept. '46
Engine Maintenance & Operation ..... Sept. '46

ELECTRICAL ARTICLES

Home-Made Telephone ..... July, Aug. '44
Battery Charging Hints ..... Aug. '44
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ed at assembly with the cross-head and the pin pressed in. If the pin is too loose, it can be lightly center punched at each end to prevent it from slipping out.

In the cross-head (detail #7) the $\frac{3}{16}$" reamed hole must be concentric with the outside diameter, which should be turned to size before the sides are flattened. The ⅛" reamed hole should be a light press fit for the wrist pin (detail #8).

The stuffing box (detail #9) must fit snugly, but not tightly, into the lower cylinder head, the $\frac{5}{16}$" and .190 plus or minus .001 diameters being concentric.

Stuffing may be made from soft cotton string (the kind usually used by bakeries for tying light packages) impregnated with graphite and vaseline. This makes a fairly steam tight packing, yet allows free passage of the piston rod.

The .249 plus 0, minus .001 diameter of the piston valve (detail #12) must slide freely, yet fit snugly in the valve sleeve. Too loose a fit will be the cause of too much steam loss.

The ⅛" reamed hole in the valve stem toggle joint (detail #13) should be a light press fit for the joint pin (detail #14).

Next month we will show additional plans of this powerful vertical engine.

G. R. CHRIST HO LAYOUT

(*Continued from page* 24)

spirit is willing and the purse permits.

On the completed layout, if it is built as shown, the "old main line" between switches A and C becomes the yard lead, permitting switching operations to take place while a train is running on the new main line. Clockwise trains can enter the yards from either the inner or outer track at the main station, while counter-clockwise trains must enter at the back, at switch C. In either case, the train can be left on the lead between switches B and C while the engine cuts off and runs around to perform yard duty. This same stretch can be used for making up trains, too: they can leave in either direction.

The engine house is necessarily small, but would hold perhaps a 4-4-0 or mogul for road work and a dockside or diesel switcher for yard work. Engine facilities are clustered on the tight wye outside which also serves to turn the motive power as required. The stem of the wye leads into a tunnel which is also the interchange track for this railroad. If space permitted, this interchange track might be extended, perhaps to the workbench.

The grade in one direction is approximately 3% while in the other direction is steeper, about 5½%. This will, as you may imagine, cut into train lengths, but anything longer than a three or four car train would look out of place on this pike anyway. Then, too, you can always run double-headers up the steep grade. By the way, I am assuming that the table is accessible from all four sides.

This pike will give a lot of real railroading fun in a relatively small space with not more than a dozen cars and one or two locomotives.

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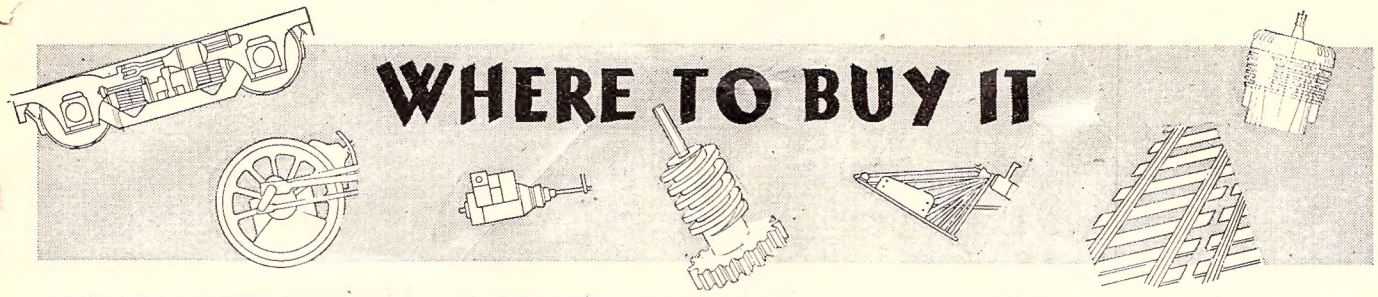

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Model Craftsman, Vol. 1. April missing; Vols. 2-3-4-5 Complete. Vol. 6 March, May missing. Railroad Magazine 101 copies, Sept. 30, April 46. Some years complete. Model Builder, Vol. 1, No. 1, 1937; April, June, August, October, December 1939. February, April 1940. Make Offer. Condition good. George Ives, 4923 52nd Ave., South Seattle 8, Washington.

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Our supplies of the following back issues of MODEL CRAFTSMAN are completely exhausted. It is therefore impossible for us to supply: Jan., Mar., Apl., Aug., 1939, July, Aug., Sept., Oct., Nov., 1940; Feb., June, Dec., 1941, Jan., 1942; and Jan., May, 1945.

GENERAL ELECTRIC O-4-4-O

(*Continued from page 6*)

to the floor. The $\frac{1}{16}$" thick washer is filed out of brass and a 2-56 hole tapped in the center of it. The washer is then soldered to the bottom of the body bolster so that the trucks can be fastened to the bolster with 2-56 screws. One bolster can be mounted right on the loco floor. The other will have to be mounted on the power truck first before it can be mounted on the floor. This is done by removing the power unit from the truck and then removing the end plates and worm shaft. The bolster can then be slipped in place and the worm shaft and end plates put back. The body bolster is then fastened to the truck bolster with a 2-56 screw and the power unit mounted in place on the axles. The assembled power truck can then be inserted in the opening in the floor and the body bolster fastened to the floor in the same way that the other body bolster was mounted.

The four tanks under the loco floor are made out of $\frac{1}{4}$" diameter brass rod. Cut the four tanks to the length shown on the drawing and file a flat on the top of each tank. The tanks should measure $\frac{3}{16}$" from the flat to the bottom of the tanks. Three $\frac{1}{16}$" wide bands of 1/64" sheet brass are soldered around each tank. The bands do not go completely around but end at the flat on top of the tank. Drill and tap two 2-56 holes in each tank and mount them in place under the floor.

The reverse switch on my model was taken from an old Lionel loco. It is mounted on a bracket so that the lever projects through a slot in the roof. Most reverse switches made for scale model locos are of the drum type. If you use a drum type reverse switch it can be mounted in the same way with the arm projecting through a hole in the roof. The wiring for the rotary type switch is shown on the drawing.

This completes the chassis of the model. Next month I will describe the construction of the loco body.

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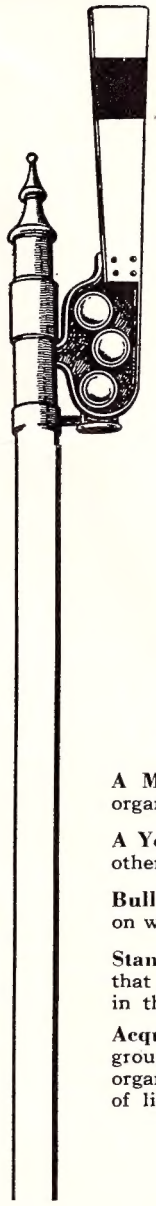

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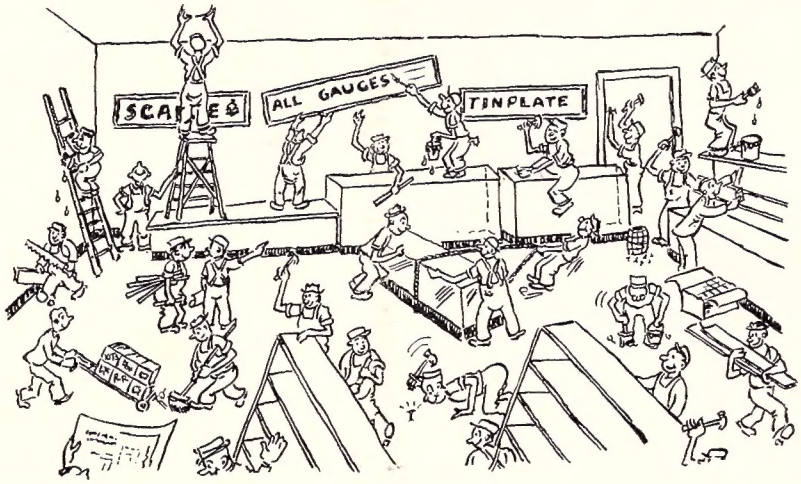

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